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FORESTRY ABSTRACTS

READERS' GUIDE SHEET

1.—New readers are reminded of the *Guide to the Use of Forestry Abstracts* which will enable them to get the maximum value from the Abstracts. *See inside back cover.*

2.—Terms appearing in the *Concise Oxford Dictionary* and Chambers's *Technical Dictionary* are ordinarily used in the text without explanation. The *British Commonwealth Forest Terminology* is followed for forestry terms.

3.—From Vol. 18 of the Abstracts up to THREE co-authors' names are cited in titles; if there are more than three, only the first, followed by *et al.*

4.—**Abbreviations.** The more common of those most likely to cause the reader difficulty are given below:—

(*a*) In title citations—

abstr.	= abstract	*n.d.*	= no date	*ser.*	= series
app.	= appendix(es)	*n.s.*	= new series	smry.	= summary
dgm(s).	= diagram(s)	ref(s).	= reference(s)	*suppl.*	= supplement
Extr. (from)	= extracted	*repr.*	= reprint	tbl(s).	= table(s)
gph(s).	= graph(s)	rev.	= revised	transl.	= translation

From Vol. 18 also, any *italicized* language abbreviation(s) indicate matter in that language additional to any summary, e.g. [Jap.e.*e.*] where English captions to graphs, tables etc. exist.

(*b*) In text—

A.C.	= alternating current	gal.	= gallon(s)	p.a.i.	= periodic annual increment
b.a.	= basal area	H.F.	= high frequency	p.p.m.	= parts per million
bd. ft.	= board foot (feet)	H.ft.	= Hoppus feet	q.g.	= quarter girth
b.h.	= breast height	h.p.	= horse-power	R.F.	= radio frequency
b.p.	= boiling point	hr.	= hour(s)	rev./min.	= revolutions per minute
c.a.i.	= current annual increment	H.T.	= high tension	*s.l.*	= *sensu lato*
c.c.	= cubic centimetre	ht.	= height	sp.gr.	= specific gravity
c.i.f.	= cost, insurance, freight	KVA.	= kilovolt-ampere(s)	sq.	= square
conc.	= concentrated (solutions)	KWH.	= kilowatt-hour(s)	*s.s.*	= *sensu stricto*
cwt.	= hundredweight(s)	lb.	= pound(s) (weight)	std.	= standard(s) (timber measure)
d.b.h.	= diameter, breast height	m.a.i.	= mean annual increment	u.b.	= under bark
D.C.	= direct current	m.p.	= melting point	V.H.F.	= very high frequency
f.o.b.	= free on board	m.p.h.	= mile(s) per hour	viz.	= *videlicet*
g.b.h.	= girth, breast height	o.b.	= over bark	wt.	= weight
		oz.	= ounce(s)	yd.	= yard(s)
		p.a.	= per annum		

In abstracts relating to the U.S.S.R.—

'CNII lesosplava'	= Central Timber-floating Research Institute
CNIIFM	= Central Plywood and Furniture Research Institute
CNIIMÉ	= Central Research Institute for Mechanization and Electrification in Forest Exploitation
CNIIMOD	= Central Research Institute for the Mechanical Conversion of Wood
CNILHI	= Central Research Institute for Forest Chemistry
UkrNIIMOD	= Ukrainian Research Institute for the Mechanical Conversion of Wood
VIAM	= All-Union Research Institute for Aircraft Materials
VNIALMI	= All-Union Research Institute for Forestry in Agricultural Improvement
VNIILM (formerly VNIILH)	= All-Union Research Institute for Forestry and Forestry Mechanization

Also *F.A.* = Forestry Abstracts.

[P.T.O.

5. **Local measures—**

arroba (Brazil, Portugal) = 15 kg.
chain = 66 ft.
cho (Japan): 1·000 cho = 2·451 acres
donum (Cyprus) = 0·333 acre
dunam (Israel) = 0·247 acre
hold (Hungary) = 1·43 acres
koku (Japan): 1·000 koku = 9·827 cu. ft.
maund (India) = $82\frac{2}{7}$ lb.
morgen (S. Africa) = 2·116 acres
mu (China) = 0·152 acres = 0·061 ha.
oke (Greece) = 2·8 lb.
pikul (Malaya) = 100 katis = $133\frac{1}{3}$ lb.
rai (Thailand) = 0·40 acre
short ton = 2000 lb.
stremma (Greece) = 0·247 acre
tan (Japan): 1·000 tan = 0·245 acre
U.S. gallon = 0·84 English gal.

FORESTRY ABSTRACTS

VOLUME 21 1960 NUMBER 1

A SUMMARY OF INFORMATION ON *AUCOUMEA KLAINEANA*

By

W. BECKING*

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1. INTRODUCTION

Most tropical timbers are valued for their grain or figure, their mechanical properties, or durability. Generally, they are heavy and hard timbers. Okoumé, however, is a light, soft, non-durable wood from Equatorial Africa, whose qualities of uniformity in colour and structure, large dimensions, high yield of face stock, and easy seasoning are commending it increasingly to manufacturers of plywood, veneers and coreboard.

This review outlines present knowledge on this promising species, including its introduction to other regions.

2. TAXONOMY, TRADE AND NATIVE NAMES

Scientific name: *Aucoumea klaineana* Pierre. Fam.: Burseraceae. Tribe: Boswellieae. Syn.: *Boswellia klaineana*.

In 1894 Henri Lecomte collected herbarium material of Okoumé in Gabon and reported it under the generic name of *Bursera*. Independently, in the same year, R. P. Klaine collected herbarium material from the neighbourhood of Libreville, Gabon, and sent it in 1895 for identification to the French botanist J. B. L. Pierre. The latter first assigned it to the genus *Boswellia* but in March, 1896, recognized it as a new genus, naming it *Aucoumea* after its commonest native name, with the single species *Aucoumea klaineana* Pierre [*Bull. Soc. Linn. Paris* 1896: 1241]. Engler and Prantl followed Pierre's second proposal, listing it under the name of *Ancoumea*, the *n* being undoubtedly a misprint; in the later revision of the tribe Boswellieae, Engler [69] listed the species correctly as *Aucoumea klaineana* Pierre. Other authors [113, 138], however, listed it as *Boswellia klaineana*, a synonym that has apparently not been incorporated in either the Index Kewensis or Engler and Prantl.

The internationally accepted trade names are Okoumé [11, 54, 91, 101] or Gaboon (British Standard: 881 and 589: 1955) and the Anglo-American trade names Okoumé [5, 91] or Gaboon, Gaboon Wood or Gaboon Mahogany [97, 126, 128]. The French, German and Dutch [27] trade names are Okoumé, the Spanish Angoume or Okume [56, 78] and the Russian Okume. Numerous native names exist, of which the following are a selection:

(*a*) *Gabon:* lower drainages of the Ogooué, Rembo N'Komi and N'Gounié rivers—Acoumé, Ojoumé, Bokumé; drainages of the Como, Middle Ogooué and Okano rivers—Angouma,

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Angume, Angoumea, Ongoumi; drainages of the Rembo N'Oogou and Nyangala rivers—Mokoui, Mokoumi, Moukoumi, Mukumi, Koumi; coastal regions round Mayumba, Loango, Madingo and Pointe-Noire, and drainages of the Kouilou and Louesse rivers—N'goumi, N'koumi. The French colonists adopted the two names Acoumé or Okoumé.

(*b*) *Spanish Guinea:* Okumé, Okumen and Uumé.

3. DESCRIPTION OF THE TREE

Okoumé is a large, evergreen tree, 30–40 m. high (exceptionally to 60 m.), with a cylindrical, usually slightly curved bole of 80–110 cm. basal diameter (exceptionally to 200 cm.), which at maturity may be clear of branches up to 25 m. or more. From about the 15th year several thin, winglike buttresses develop but seldom extend above the first metre from the ground, save on wet sites where they may ultimately extend 3 m. up the stem. The crown is large and globose, with spreading branches and a distinctive greyish-green appearance. The foliage is confined to the tips of the branches. Nothing appears to have been published regarding the root system, but it is said to be flat and spreading. The bark is light grey, very similar to European Beech, completely smooth, and thin (5–8 mm., max. 10 mm.). In young trees it is more whitish grey, and in older trees more reddish grey, with longitudinal flakes and densely covered by numerous crustaceous lichens. The fresh blaze is salmon pink and easily crumbled because of its short fibres. When bruised, the bark slowly exudes a clear, greyish or almost whitish gum having a penetrating turpentine odour. The fresh wood burns with the same odour. Record [126] reports that large clumps of Okoumé trees make their presence known at a considerable distance by the pronounced smell of the bark. The gum turns black [136] or an opaque whitish colour on drying [88]. The natives extract it from the fresh bark to use in torches, and it is in some demand for the perfume industry. The flow of gum varies with the season, being at its peak in periods of increased sap-flow (beginning of the rainy period). Engler [70] calls the exudate clear yellow, which is actually its colour after distillation.

The leaves are alternate, odd-pinnate with 3–6 pairs of opposite, oblong-lanceolate, long-acuminate leaflets, the alternate position of the leaves being generally most distinct at the end of the branchlets. The leaflets have a glossy upper surface and an entire, undulate margin. They are 14–30 cm. long and 4–9 cm. wide, somewhat leathery, and penninerved, with 10–16 pairs of lateral nerves fusing arcuately near the margin. The rhachis is up to 40 cm. long, slightly thickened at its base and with a narrow basal groove; the petiolules are 15–40 mm. long, thickened at both ends. The young rhachis and petiolules are covered with a reddish to ferrugineous puberulence. The inflorescence is a panicle, 10–20 cm. long, terminal or axillary. Its axis and the larger pedicels are covered with a dense ferrugineous or greenish-yellow puberulence [78, 88]; the 2-mm.-long pedicels are generally covered with a similar reddish to ferrugineous indumentum [78].

The inconspicuous pentamerous flowers are bisexual and practically without scent. The reddish bracts are caducous. The sepals are greenish to brownish, 5 mm. long, triangular-lanceolate to lanceolate with obtuse apices, the petals off-white, 5·5 mm. long, spathulate-oblong or lanceolate, and narrowed to the base, with recurved apex, puberulous on both surfaces, imbricate in bud and alternate with the sepals. The receptacle is somewhat concave with a glabrous, yellow, annular extrastaminal disc with 10 fleshy glandular lobes. The stamens are free or united in pairs, usually 9, max. 10, with the 5 outer ones opposite the sepals and the 5 inner ones opposite the petals. The filaments are 7 mm. long, linear-subulate and pubescent. The paired anthers are ovate, and dehisce by a longitudinal slit facing the ovary. The ovary is superior and syncarpous, of 5 carpels each with 2 collateral orthotropous ovules near the base. The stigma is short and 5-lobed.

The fruits are grouped 20–50 in a panicle. The 5-locular capsule is glabrous, turbinate, 4–5 cm. long, 2–3 cm. wide near the apex, pentagonal in cross-section, with one winged seed per locule. The pericarp is hard, dry and dehiscent from its base, with 5 valves [139]. Dehiscence from the apex is suggested by drawings [in 69, 70, 88, 12]. The central columella is persistent after dehiscence.

There are ca. 4500 seeds/lb. or 10,000 seeds/kg. The seed is 8 mm. long and 4–5 mm. thick, the thickness being accentuated by pronounced lobes. The wing is 30 mm. long and 6 mm. wide at the base of the seed. The seed is yellowish red, more or less triangular, convex towards the outside and concave towards the inside, which is pressed against the columella. It contains a white pulpy mass with a turpentine odour.

4. DISTRIBUTION

The Okoumé is confined to tropical West Africa, chiefly between 2° N. and 4° S. latitude. Its range includes Spanish Guinea (Rio Muni), Gabon and the Mayumba plains of the French Middle Congo.

The species has also been reported from Cameroon [65] and the Belgian Congo [65, 128] but these reports have not been confirmed by other investigators. Mell [113] erroneously reported it from Cameroon to South Angola.

In its distribution Okoumé is limited to a lowland rain climate having 2000–2480 mm. annual rainfall and a dry spell of generally 3½ months (June–September) with less than 30 mm. rain per month. It does not, apparently, extend its range into a lowland monsoon climate with a major dry spell exceeding 5 months. Its optimum range coincides roughly with cretaceous formations and alluvial coastal deposits. It grows generally below 200 m. elevation in the low land of the drainages of the Benito and Muni rivers, the estuaries of the Gabon river, the Ogooué river as far as Ndjolé (300 km. upstream), the lower basin of the N'Goumé river as far as the falls of Sindara near Mouila and N'Dendé, the lagoon area of Fernan-Vaz with the basin of the Rembo N'Komi, and the coastal lagoons of Igúela, Setté-Cama, Mayumbo and Madingo. In total, this optimum range comprises ca. 2,600,000 ha. Outside it, Okoumé occurs on acid soil derived from crystalline rock formations but is very dispersed. Local concentrations are reported from Gabon in the basin of the Okano river, in the forests of Mitzik and Oyem, and in the Etéké region of the upper N'Goumé river, where it is found in the Du Chaillu mountains up to ca. 800 m. [36]. Gayraud [in 36] is quoted as being doubtful of its occurrence along the middle Ogooué river between Lastourville and Booué.

5. HABITAT AND ECOLOGY

Okoumé is a pioneer of the lowland rain forest below 300 m. altitude, maturing under favourable growth conditions in about 80–100 years. It is an aggressive colonizer of forest clearings, abandoned fields, dry river-beds, dried lacustrine deposits and eroded river-banks, often forming dense, pure and even-aged stands. In its southern range, it occurs abundantly along the fringe of the numerous man-made savannas, which it would reforest readily if recurring grass fires did not kill it. Being a shade-intolerant species, it is extremely sensitive to overhead shade in early life and can only survive in the secondary forest if it can continuously outgrow its competitors. If suppressed it soon dies.

Heitz [88] has suggested that in virgin forest Okoumé occurred exclusively at the edge of the swamps forest type dominated by the Ozouga (*Saccoglottis gabonensis*, Humiriaceae). This type occupie- poorly drained sites in which extreme edaphic conditions limit the floristic composition to relatively few species, in contrast to the extremely heterogeneous composition of the adjacent rain forest. The Ozouga forest canopy is always quite open and Okoumé regeneration is frequently observed along its edges. The relatively sparse growth of shrubs and herbs gives this intolerant Okoumé regeneration a good chance to develop into mature trees.

The Okoumé has undoubtedly extended its range as a result of increased clearings and disturbances in the original forest cover [65, 136], its present natural distribution being well correlated with the pattern of shifting agriculture. When, after 2–4 years, the fields are abandoned, natural reforestation starts immediately in the absence of fires, and a secondary forest rich in fast-growing intolerant species, in which are almost pure stands of Okoumé and Musanga characterized by a dense shrub layer and numerous lianes and climbers, will colonize the clearing within 5–8 years.

This initial phase the natives call 'combo-combo' [48]. The next phase of secondary forest succession is characterized by many semi-tolerant and tolerant species like *Khaya ivorensis*, *Terminalia superba* and *T. ivorensis*, with Okoumé occurring generally as large isolated trees without any regeneration. In the final phase all intolerant species disappear, so that Okoumé is no longer present. Practically all coastal forests in this region are secondary; no primeval forest is considered to remain, owing to the pressure of shifting agriculture. If grass fires interfere repeatedly with the normal secondary forest succession, man-made savannas are formed in the middle of the rain forest. These the Okoumé tends to invade rapidly, but the young trees are easily killed by fire.

The Okoumé, being a highly adaptable species, has probably not yet reached its maximum range and it may expand into the lowlands of Cameroon within the isohyet of 2000 mm. annual rainfall; expansion toward the south, however, is hardly possible because of the change to monsoon climate.

6. RANGE AND CHARACTERISTICS OF OKOUMÉ VARIETIES

Three varieties of Okoumé have been distinguished, based chiefly upon characteristics of wood colour and structure:

Var. 1. *White Okoumé:* Okoumé blanc [36], Okoumé pale [63], Okoumé rose [33]. Okoume cambogala, Okoume combo-combo, Okoumé combo, Okoumé-wi-Nkombo-bombo [35, 36, 50, 71, 140].

This variety grows exclusively in the coastal plains and in the estuaries of the large rivers from Kogo on the Muni River (Spanish Guinea) to as far south as Mayumba, and inland generally only below 200 m. altitude. It is found on swampy sites with soils of high organic-matter content and a high ground-water table [88] or else as fast growing trees in abandoned fields [48]. The wood is whitish with an indistinct sapwood/heartwood separation. It has a low density and a low resistance to weathering and decay.

Var. 2. *Red Okoumé:* Okoumé faux [91], Okoumé rouge [33], Faux Acajou du Gabon [71], Rose-coloured Okoumé [91]. Okoumé nyangala, Okoumé-w'Ozouga [140].

This variety generally grows on higher and better drained sites, occurring chiefly in the interior of Gabon between 100 and 300 m. altitude and occasionally up to 800 m. It is exploited mainly along the Ogooué River, Lake Azingo and the Nyangala River. It grows best on lower slopes or the better drained sites in valley bottoms, but can be found even on dry, shallow, and rocky ground. The bark is redder than in the Ozouga variety. The heartwood is denser than that of the White Okoumé, probably owing to less favourable growing conditions, with a small and lighter coloured surround of sapwood, but the colour differences are obvious only in freshly cut logs.

Var. 3. *Ozouga variety:* Okoumé foncé [71], Okoumé frise [33, 104], Okoumé chénille [48]. Red-coloured Okoumé [91], Curly Variety [126]. Okoumé ozouga, Okoumé zouga [35, 36, 50, 2, 12]. Okoumé-w'Igandji [140].

This variety, which is not to be confused with the Ozouga species, *Saccoglottis gabonensis*, already mentioned on p. 3, does not seem to be restricted either geographically or edaphically, individual specimens being interspersed among most of the larger Okoumé populations. It has the highest wood density of the three, and the highest resistance to weathering and decay; also the darkest bark, red-brown and often even blackish. The wood is generally of a deep red colour when freshly cut and has a heavily interlocked grain which is detectable from surface inspection of the log, and it must be sliced, not rotary cut. This interlocked zone, however, is found only in the outer periphery of the bole, to a depth not determinable by surface inspection. Because of this and the high density, logs require to be steamed before being put on the lathe. It has been suggested that the cause of interlocked grain is slow growth not directly attributable to ecological differences of the site but rather to suppression and competition in the root and crown layers [63]. Its frequent occurrence in large trees, however, suggests that it is associated with advanced age. Generally, the logs of this variety are very straight and of superior bole length and diameter, predicating a high yield of veneer.

Fabre [71] has reported another black variety that occurs, only rarely, in the interior of Gabon. Its density is greater than 1·0, so that the logs cannot float. The wood is described as being of excellent quality and durability, its colour a deep dark red, almost black. Since neither the trade nor other investigators have collected this variety, it seems doubtful that this wood belongs to the Okoumé.

7. LEAF-FLUSH, FLOWERING AND FRUITING

Periodic leaf-shedding of Okoumé occurs irregularly, varying from tree to tree as with many other species of the tropical rain forest. Immediately after leaf-fall the young foliage—temporarily of a reddish colour [88]—is produced, together with the flowers. Generally this brief period of leaf-fall and flowering occurs after the major dry spell, i.e. from October to December, rarely January [35, 36, 65]. Flowering is abundant.

The fruits change colour as they mature, from green to purple-red, and are generally fully ripe by November-December. They open between the end of December and February, releasing the maximum of seed in the first half of January.

8. SEED PRODUCTION AND DISPERSAL

Okoumé seeds prolifically. Generally a heavy seed-year will be followed by 1–2 poorer ones, but individual trees vary, some producing abundant seed year after year.

Donis [68] reported that trees of a 14-year-old plantation in Gabon had started to produce seed. In Java, Hellinga [89, 90] and Soemarjo Joeswopranjoto [131] reported abundant flowering in a plantation in its 10th year, one that could not be visited earlier because of World War II. In Surinam, Den Hulster [67] reported first flowering in a 5-year-old plantation. It may be concluded, therefore, that Okoumé will start to produce seeds at an age of 5–10 years.

Seed dispersal is generally considered to be by wind [35, 36, 50, 88]. According to Capdevielle [56] it can also be effected, at least in part, by animals and birds, a contention that he supports by the following observations: (*a*) dehiscence of the fruit occurred in 80% of cases only at the moment of fruit-fall, when many seeds were still adhering firmly to the valves; (*b*) a disproportionate number of

fruits lying round the tree base still enclosed most of their seeds; (*c*) establishment of Okoumé regeneration was not in some places related to the local wind and storm pattern; (*d*) seed dispersal occurs in the middle of the rainy season. It is not known whether Okoumé seed will still be viable after passing through the digestive tract of animals or birds.

9. GERMINATION AND LONGEVITY OF SEED. THE SEEDLING

The seeds remain viable for a maximum of 3 weeks, 80% germinating if they are very fresh but only 15% after 2 weeks of storage [48]. No effective method has so far been developed for prolonging viability. This is one of the major problems of Okoumé silviculture, since seed has to be collected and sown immediately in order to provide sufficient planting stock. Fortunately, as noted above, Okoumé produces abundant seed regularly, and so far no serious deficiency of seed has occurred in Gabon in the vicinity of natural stands [36, 48, 49].

The seedlings have kidney-shaped cotyledons. The first 4–5 leaves are not compound. Seedlings require some shade initially and ample soil moisture. After development of the first few leaves, full light is required for best development; this intolerance of shade persists for at least the first 20–25 years of growth [35, 36].

10. SILVICULTURAL CHARACTERS

Light

As already indicated, Okoumé is a strong light-demander after the earliest seedling stage. If the tree crown is overtopped, stagnation of height growth will be the immediate result. Repeated release cuttings or thinnings are therefore needed to assure an adequate number of harvestable Okoumé trees in the secondary forest; provided that it can maintain its dominance in the crown canopy, it will grow into a very large tree.

Coppicing Power

It appears, from the absence of any reference to this in the extensive literature, that Okoumé has little or no power to coppice or produce suckers.

Moisture

Okoumé cannot compete successfully with natural forest vegetation where seasonal droughts of more than 5 months regularly occur. It is strictly limited in its distribution to the rain forest. Rapid optimum growth is strongly correlated with moist but well drained sites. On drier sites, growth is much slower and the bole tends to develop forks, crooks, and persistent lower branches [67, 131].

Fire

Because of the high content of inflammable resin in its bark, Okoumé is very susceptible to fire. Even large trees are easily killed by a ground or brush fire which will quickly ignite the entire tree. Intensive fire control and prevention are therefore prerequisites for successful stand establishment.

Diseases and Pests

The only known disease of Okoumé is caused by *Pestalozzia aucoumeae* [117]. The fungus, found in young plantations, was isolated from cankered wood, of which it is believed to be the cause. *Hypomyces ipomoeae* is a common associate [117].

Overtopped, stagnating seedlings are susceptible to insect attack. Borers (Coleoptera) will attack the main and side shoots, contributing to the seedling's death. No mammal damage has been reported.

Liability to fungal and insect attack rapidly declines as the tree gains in height. Rapid early height growth is therefore essential for reducing losses from these sources.

11. NATURAL REGENERATION

Natural regeneration occurs frequently throughout the entire range of the Okoumé, but is particularly abundant on recently cleared or abandoned fields. Aubréville [36] has published data on the diameter distribution of Okoumé trees from enumeration surveys in 100-ha. blocks:

D.b.h. range:	20	30	40	50	60	70	80	90	100 cm.
	Number of Okoumé stems per 100-ha. block								
Block 1	5017	2084	2208	1690	1071	790	486	309	278
2	3898	1808	1344	1197	738	490	272	156	150
3	509	331	363	369	312	252	191	126	197
4	153	141	134	162	142	124	82	68	161
5	146	137	142	174	175	173	111	91	154
6	79	132	184	264	344	328	276	176	253

The average frequency of occurrence is approximately 1–2 Okoumé trees per ha. for d.b.h.'s over 60 cm., the maximum being 20–25 per ha. This table and other surveys [107] indicate that Okoumé regeneration is not uniformly distributed but often gregarious in nature, creating pure and even-aged concentrations on optimum sites. Optimum conditions for establishing it are: (1) moist and well drained sites on the lower parts of slopes and in the valleys, (2) plenty of light to maintain the essential rapid height growth, and (3) a tropical rain climate with regular falls of rain. This last is particularly important during the initial stages of seedling development, when a prolonged drought of several weeks will jeopardize its survival over the competing ground vegetation.

Natural regeneration is still advocated as the best and most desirable way for establishing Okoumé stands [30, 46, 81, 82, 112]. However, the artificial creation of optimum conditions in the natural environment reveals the importance of such factors as the proximity of seed-trees, adequate light and soil moisture, and continued elimination of the competing vegetation. The first legislative measures aimed at utilizing and safeguarding natural regeneration for sustained Okoumé production included prohibiting the use of fire in reforesting small savannas, and marking and preserving seed-trees in the logged tract (legislation dating from 1904 and 1907).

Repeated and timely release cuttings or thinnings are considered an absolute necessity if an adequate number of harvestable Okoumé trees is to be ensured in the future. In the most favourable cases, 20–37% of pole-sized Okoumé may develop into mature and harvestable crop trees, but generally only 9–18% survive. As payment towards the frequent inspections and silvicultural operations involved, the forest service in Gabon levies a cutting tax upon each timber operator. For Okoumé, this tax is Fr.CFA 3.00/cu.m. of harvested timber designated for export [71].

Aubréville [37, 40] contends that, considering the required intensity of silvicultural operations, enrichment methods depending wholly on natural regeneration result in a disappointingly low number of Okoumé crop trees. Natural regeneration, moreover, occurs too irregularly to be depended upon. In his view, and that of others, the major reason why such methods are inadequate and too risky for large-scale conversions into a mixed production forest of Okoumé, is that the present secondary forests have been severely degraded, i.e. unbalanced in composition, in the past decades by repeated removal of the prime commercial specimens without any regard to regeneration and sustained yield [35, 37, 38, 39, 44, 49, 59, 9, 107].

In Nigeria and Ghana, regeneration of native species is successfully obtained under the so-called Tropical Shelterwood System, a method—possibly applicable to Okoumé—featuring different degrees of release or patch clearing adapted to the specific ecological requirements of the commercial species, like *Khaya* spp. and *Terminalia superba* [46, 72, 75, 123, 134, 135]. The formation of Okoumé stands is undoubtedly favoured by disturbances, clearings and logging operations, and selective logging in particular tends to natural enrichment with Okoumé, always provided a sufficient number of seed-trees is left in the logged tract. Okoumé, however, tends to grow best in homogeneous and even-aged stands.

[*Part II (and bibliography) will appear in next number.*]

EDITORIAL NOTE

For the facility of our growing body of readers, an Author Index is in future being provided with each number of the Abstracts, in addition to that in the annual four-part Index.

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

Translations

See Nos. 14, 949, 958, 1025, 1069, 1106, 1114.

0 (021). Handbooks. Textbooks

1. PERRIN, H. Sylviculture. Tome III. Travaux forestiers. **[Forestry. Vol. 3. Forestry operations.]** École Nationale des Eaux et Forêts, Nancy. 1958. pp. 405 + 45 photos, 5 dgms., 4 tbls. 949 refs. [F.]

[Cf. *F.A.* 16 No. 2580.] This volume deals with: (1) operations for the improvement of the forest soil (cultivation, fertilizing, weed control etc.); (2) tending of trees (thinning and pruning); (3) artificial regeneration; (4) forest protection.

0 (048.1). Bibliographical Lists

See Nos. 33–4, 188–90, 238.

0 (05). Periodicals. Yearbooks. Directories. Almanacs, Calendars, Diaries

See also No. 1292.

2. ***Research Note, Pacific Southwest Forest and Range Experiment Station.*** Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.

Formerly *Forest Research Note, California Forest and Range Experiment Station.* The name of the station was changed from California to Pacific Southwest Forest and Range Experiment Station in April, 1959; all the series published by it will continue. Citation in *F.A.*: *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* This abbreviation of the Station's name will also be used in *F.A.* for the other serial publications of the Station.

3. ***Forestry Technical Papers.*** Forests Commission of Victoria, Melbourne.

Forestry Technical Papers is produced principally for departmental circulation. It has absorbed the *Plantation Technical Papers* series, which will now cease to be issued. Citation in *F. A.*: *For. tech. Pap. For. Comm. Vict.*

0 (084.3/4). Maps. Atlases

See Nos. 301, 316.

0 - - 014. Classification

See Nos. 112, 1284.

0 - - 015. Mathematical and Statistical Methods

4. JEFFERS, J. N. R. **Multiple regression analyses by electronic computer.** *Emp. For. Rev.* 38 (3), 1959 (278–86). 5 refs.

Describes a multiple regression programme written for the Ferranti Pegasus Computer (and extensively used by the Forestry Commission), able to cope with an indefinite number of observations on 37 independent variables, and capable of giving, optionally, summaries of data, correlation coefficients, significance tests, frequency distributions of the original data, etc. The preparation of the data, and of the data and steering 'tapes', is illustrated by reference to a project in which the relations of height growth in young Japanese Larch to the measured values of N, P and K were calculated for models of increasing complexity. The new possibilities opened to research by these facilities are discussed.

5. WEIDMANN, A., and THOMMEN, F. Das maschinelle Lochkartenverfahren als Rationalisierungsmittel in der Forstwirtschaft. **[Mechanical punched-card systems as a means of increased efficiency in forestry.]** *Mitt. Schweiz. Anst. Forstl. Versuchsw.* 35 (4), 1959 (317–68 + 1 dgm. + 9 specimen cards & 1 specimen envelope). 125 refs. [G.g.f.it.e.]

Discusses the chief features and the differences in scope or technique of such systems, and gives examples of their practical application in forestry research, survey, management, scaling, accountancy etc., from Switzerland, Sweden, Austria and Germany, with sample cards for general and forestry uses. There are also two diagrams, one showing the sequence of operations in arriving at volume increment per [uneven-aged] stand from sample data, by means of the computation of volume and cambial-area tariffs and the mean cambial area and ring width per stand; the other, a programme for the evaluation of an actual sample survey in a working-plan revision by the *méthode du contrôle*. Finally, the desirability of introducing the system on a large scale into Swiss forestry, with the attendant problems of organization, standardization, degree of centralization etc., are discussed.

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. Site Factors: Climate, Situation, Soil, Hydrology (Water Conservation, Soil Conservation and Erosion)

See also No. 299.

6. **[Site classification.]** *Sylwan* 103 (5), 1959 (7–38). [Pol.]

A collection of papers: The bases of site classification as applied in silviculture and management by the Polish State Forest Service (*L. Mroczkiewicz*); A forest site classification system (*T. Trampler*); Field techniques in making site maps (*K. Mąkosa*).

7. HOUBA, A. Mapování lesních půd z hlediska stanovištnětypologického. **[Mapping forest soils from the standpoint of site classification.]** *Sborn. Čsl.*

Akad. Zeměd. (*Lesn.*) 5 (6), 1959 (667–72). 16 refs. [Cz.cz.]

A short review of the problem, discussing the main principles of soil mapping. All the references save one are to Czech literature.

111.2. Radiation and Temperature

See also Nos. 297–8.

8. TOMANEK, J. Mikroklimatyczne badania nad pionowym rozkładem ekstremalnych temperatur powietrza w borze mieszanym Lasów Doświadczalnych SGGW w Rogowie. [**Microclimatic investigations on the vertical distribution of air temperature extremes in a mixed stand in the Rogów Experimental Forests of the Agricultural University of Warsaw.**] *Zesz. nauk. Szkol. Gospod. Wiejsk. Warsz.* (*Leśn.*) No. 2, 1959 (83–120). 22 refs. [Pol.g.russ.]

The investigations were made in and near a 90- to 100-year stand of Pine/Spruce (9/1), with some Hornbeam and Oak in the lower storey, and mixed shrub and herbaceous layers. Measurements of temperatures were made at heights above the ground of 5 and 50 cm. and 1 and 2 m.; at 5·8 m. (above the shrub layer); 12·6 m. (the lower crown region); and 19·2 m. (the upper crown region). Readings were taken daily at 9 p.m. from 1950 to 1954. Within the forest, max. temperatures were generally lower, min. temperatures higher, and the amplitude of fluctuation less than in the open, but on some days, in certain circumstances dictated by season and weather, these regular tendencies were not always observed. The daily vertical distribution within the stand was variable, but over a year, or several years, a pattern emerged in which the max. temperatures were lowest at the soil surface, and the min. temperatures lowest at 50 cm.; both max. and min. temperatures reached their highest values in the tree-crown region. The temperature amplitude increased from the soil surface to the crown region. The greatest differences between temperatures within the stand and outside it occurred, both for max. and min. temperatures, at the level nearest the ground. [Cf. *F.A.* 17 No. 3567.]

111.8. Climatology. Climate and Microclimate

See also Nos. 8, 277, 308, 456, 503, 860.

9. MOHRMANN, J. C. J., and KESSLER, J. **Water deficiencies in European agriculture. A climatological survey.** *Publication, International Institute for Land Reclamation and Improvement, Wageningen* No. 5, 1959. pp. 60 + 10 maps. 20 refs. [E.e.f.g.span.]

Presents in tables, diagrams, and maps, calculations of water shortages from the data of 287 stations, based on the difference between potential evapotranspiration (according to Turc's formula) and precipitation, showing surplus and deficit periods, the likely frequency of serious shortages within 10-year periods, etc. For optimum growth of luxuriant crops more than half of Europe has deficits > 100 mm.

10. SETH, S. K., and KHAN, M. A. W. **Bioclimate and plant introduction in dry zone.** *Indian For.* 85 (7), 1959 (376–84). 1 ref.

The study of climate and climatic homologues is an essential prerequisite in any scheme of plant introduction. This is particularly so for afforestation practices in the dry zone.

The broad principles relating to influence of climate on the distribution of plants are reviewed and Emberger's climatic index is worked out for the dry zone of India in order to delimit climatic sub-types. It is, however, felt that the sub-types so formed do not harmonize with the natural vegetation types of the area. The concept of 'effective temperature index' is therefore developed, which sufficiently modifies Emberger's formula to bring it into consonance with the natural vegetation types. Instead of plotting Q, the bioclimatic value $(200P/M^2-m^2)$ against m (av. min. temp. of the coldest month), it is plotted against $m(M-m)$ where M is the av. max. temp. of the hottest month. *Authors' summary.*

113. Situation

See No. 23.

114. Soil. Soil Science

114.1 Soil Physics

See also Nos. 40, 223–4, 308, 449, 502.

11. EHWALD, E., *et al.* Itogi stacionarnyh issledovanij vodnogo režima pesčanyh i suglinistyh s pesčanym pokrovom počv pod lesom bliz Ébersval'de. [**Permanent investigations of the moisture regime of sandy soils and clay-loam soils overlain with sand, both under forest near Eberswalde.**] *Počvoved.* 1959 (7), (14–24 + 2 sets of dgms.). 2 refs. [Russ.g.] A.P.B.

The investigations, which were started in 1954, are in stands described in earlier work [see *F.A.* 18 No. 29]. Chrono-isopleths of soil m.c. and suction (as measured by Richards' pressure-membrane and Sekera's capillary meter) are given.

12. TAMM, C. O., and TROEDSSON, T. **A new method for the study of water movement in the soil.** *Geologiska Föreningens i Stockholm Förhandlingar, Stockholm* 79 (3), 1957 (581–7 + 1 plate). [E.e.] O.R.S.

A weak solution (e.g. 1%) of NH_4SCN is applied to the soil, and after a suitable interval a profile is dug up and sprayed with a strong solution (e.g. 20%) of $FeCl_3$. All parts containing thiocyanate become deep red. Examples of the use of the method in Pine and Spruce stands are described.

114.2. Soil Chemistry

See also Nos. 16–9, 24–5, 27, 61–3, 232, 235, 240–2, 303, 473, 475.

13. ZAJCEV, B. D. Opyt ustanovlenija zavisimosti meždu soderžaniem obmennyh kal'cija i kalija, podvižnogo fosfora i obščego azota v peregnojno-podzolistyh gorizontah lesnyh počv. [**Determining the relations between the content of exchangeable Ca and K, mobile P and total N in the humus-podzolic [A_1] horizons of forest soils.**] *Počvoved.* 1959 (3), (72–6). 2 refs. [Russ.] A.P.B.

Analysis of the nutrient contents of samples taken from A_1 horizons under coniferous and coniferous/broadleaved forests in the U.S.S.R. revealed a

straight-line relation between their magnitudes. The content of exchangeable Ca was shown to be largely determined by the clay particles present in the mineral horizons, but in the humus-podzolic A_1 horizons it begins to become independent of the clay present.

14. KONONOVA, M. M., and ALEKSANDROVA, I. V. **The biochemistry of humus formation and some problems of plant nutrition.** *Soils & Fertil.* 22 (2), 1959 (77–83 + 1 photo). 24 refs. Transl. from: *Izv. Akad. Nauk SSSR* (*Ser. biol.*) 1958 (1), (79–88).

A review of mainly Russian literature.

15. GORHAM, E. **Chlorophyll derivatives in woodland soils.** *Soil Sci.* 87 (5), 1959 (258–61). 8 refs. O.R.E.

[Cf. *F.A.* 14 No. 1881.] Deals with the occurrence of the derivatives in surface soils under Oak. The organic matter of mor-humus layers contains about twice the concentration present in that of mulls. Increasing concentration is clearly correlated with decreasing soil pH.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 14–5, 31–2, 61–2, 232, 240–2, 473, 475.

16. DOLGILEVIČ, M. I. K voprosu gumusovyh veščestv v buryh gorno-lesnyh počvah Kryma. **[The humus substances in the brown montane-forest soils of the Crimea.]** *Počvoved.* 1959 (7), (110–2). 4 refs. [Russ.russ.e.] A.P.B.

Tabulates the SiO_2, sesquioxide, CaO and MgO contents of freshly fallen and older litter from Oak and Beech forests, each on (1) limestone, and (2) mixed argillaceous schists and sandstone. Gives also the contents of humic acids in the soil under the four types of stand. A relationship was found between the ash content of the litter, the mobility of the ash substances of the older litter, and the content of humic acids in the soil. More Ca was present in litter on (1) than on (2) and more Ca humates were found in the humus on (1) than (2).

17. SOKOLOV, D. F., and TJUNEEVA, T. N. Podstilka i ee rol′ v formirovanii sostava gumusa lesnyh počv južnoj časti lesostepi. **[Forest litter and its role in the composition of humus in forest soils of the S. part of the forest steppe.]** *Počvoved.* 1959 (8), (65–75). 24 refs. [Russ.russ.e.] A.P.B.

Two 10 × 10-m. plots were set up in (1) a 220-year Oak/Ash stand on dark grey soils, and two also in (2) a 60- to 70-year Oak stand on a residually podzolized-solodized solonetz soil. Of each pair of plots, one, (*a*), was left undisturbed, and the other, (*b*), kept clear of litter and grassy vegetation for 40 months. Analysis of soil samples then showed that in the top 40-cm. layer of soil in (1), the content of organic C and of N in (*b*) had fallen by 36·8 and 3·74 tons/ha. respectively by comparison with (*a*). On (2), the losses were 14·6 and 1·55 tons/ha. respectively. The greatest reduction in the composition of the humus was in the group of easily soluble compounds containing C; the most resistant compounds in the humus complex were the group of humic acids.

18. KUCERA, C. L. **Weathering characteristics of deciduous leaf litter.** *Ecology* 40 (3), 1959 (485–7). 7 refs.

Studies were made on the decomposition of litter of American Elm, Sugar Maple, Shagbark Hickory and White, Northern Red and Blackjack Oaks. In general, Oak litter was the slowest and Elm the quickest to decompose. The Oak litter had less total mineral, less soluble materials as determined by hot-water extraction, and the least decrease in K in the initial weathering phase.

19. ZÖTTL, H. Die Bestimmung der Stickstoff-mineralisation im Waldhumus durch den Brutversuch. **[Determining N mineralization in forest humus by the incubation method.]** *Z. PflErnähr. Düng.* 81 (1), 1958 (35–50). 55 refs. [G.g.] O.R.S.

A critical examination of the incubation method showed that temperature, moisture, aeration and storage method influence the results. The procedure recommended as standard is to rub undried samples through a 2-mm. sieve, bring them to, and keep them at, 60% of maximum water capacity in small glass containers at 20° C. If the litter is removed before samples of humus are taken, the influence of fresh leaf-fall is eliminated and incubation experiments started at different times during the growing season yield comparable results. Amounts of mineralized N determined after 6 weeks' incubation of humus from Pine and Spruce forests in Bavaria were directly related to the growth performance of the stands.

114.4. Soil Classification. Soil Types

See also Nos. 6–7, 238–9, 306.

20. LÅG, J., and MORK, E. Jordsmonnet i Ulvsjøberget forsøksområde. **[The soils of the Ulvsjøberg experimental area [Hedmark, E. Norway].]** *Medd. Norske Skogforsøksv.* 16 (1), No. 53, 1959 (5–41 + 1 map). 25 refs. [Nor.nor.e.]

21. UGGLA, H. Gleby leśnictwa Strzelna Lasów Doświadczalnych SGGW. **[The soils of Strzelna Forest District—experimental forests belonging to the [Polish] Central School of Agriculture.]** *Sylwan* 102 (1), 1958 (1–42 + 5 maps). 34 refs. [Pol.russ.e.]

Defines the 15 main types of podzolic soils occurring in the forest, tabulating data on their mechanical composition, chemistry, physical properties, profiles etc., and indicates the most suitable species and mixtures for them.

22. ZONN, S. V. O počvah vostočnoj časti Tibeta i zakonomernostjah ih raspredelenija. **[The soils of E. Tibet, and their distribution patterns.]** *Počvoved.* 1959 (6), (1–15). [Russ.e.] A.P.B.

The study was made in the area N. of Chengtu [Szechwan, China], ca. 31–33° N. and 102–104° E., at altitudes up to ca. 4100 m. Seven main soil types in vertical distribution are distinguished, including the following forest soils: cinnamon-brown soils under Oak forests; brown soils under Spruce and coniferous/broadleaved forests; pseudo-brown-podzolic soils under Fir and Fir/Spruce forests; high-altitude meadow-forest soils under

Spruce and broadleaved scrub. Results of mechanical and chemical analyses of some of the soils are tabulated.

23. KRAUSE, H. H., RIEGER, S., and WILDE, S. A. **Soils and forest growth on different aspects in the Tanana watershed of interior Alaska.** *Ecology* 40 (3), 1959 (492–5). 5 refs.

Analysis of soils and vegetation on the steep S. and N. slopes of a high narrow ridge demonstrated that in the sub-arctic region a distance of a few dozen yards between slopes of cardinal orientation can result in radical changes in the genetic nature of the soil, the vegetative cover, and the pattern of silvicultural management and land use. On the S. slope a well drained soil of the sub-arctic brown forest group has developed, and supports mature White Spruce (*Picea glauca* var. *glauca*) which should be rated among the most rapidly growing and valuable forest stands of interior Alaska. On the N. slope, a poorly drained 'highmoor' half-bog soil is occupied by a stand of non-merchantable dwarfed Black Spruce of extremely slow growth.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 6–7, 13–4, 32, 60, 63, 66, 232–3, 235–42, 298–9, 319, 466 *et seq.*, 835.

24. GAGNON, D., LAFOND, A., and AMIOT, L. P. **Mineral nutrient content of some forest plant leaves and of the humus layer as related to site quality.** *Canad. J. Bot.* 36 (2), 1958 (209–20). 33 refs. O.R.S.

An analysis was made of nutrients in the leaves of herbs, dwarf shrubs, and mosses, from 11 site types of 4 site classes in 3 regions of the coniferous boreal forest in N.E. Canada. No differences were found within a given species that could be related to site quality, but the available-nutrient content of the A_0 horizon within a region was closely related to site quality. It appears therefore that the differential accumulation of nutrients in the plants studied depends upon the inherent properties of the species rather than the quantity of nutrients in the humus on which they grow.

25. MINA, V. N. Nekotorye voprosy izučenija plodorodija lesnyh počv. **[Some problems in studying the fertility of forest soils.]** *Počvoved.* 1959 (6), (88–94). 8 refs. [Russ.e.] A.P.B.

Discusses the difficulties of assessing soil fertility, the necessity of adequate samples, and the importance of a preliminary study of the distribution of the particular substances under examination. Expressing results as weights of nutrients per unit weight of soil does not accurately reflect the true status of plant nutrition, because the thickness of the layer occupied by absorbing roots is ignored. Nutrient determinations should be made in the layer of soil where most of the absorbing roots are found, and results expressed as weights of the nutrient (in kg.) in the main rooting layer per unit area (ha.), as well as in mg. nutrient/100 g. soil. This principle is illustrated by an example showing P_2O_5 and K_2O contents of soil in Spruce forests of various types.

26. KOWAL, J. M. L., and TINKER, P. B. H. **Soil changes under a plantation established from high secondary forest.** *J. W. Afr. Inst. Oil Palm Res.* 2 (8), 1959 (376–89). 8 refs.

Reports on a long-term experiment to determine the effect on soil fertility of intercropping, leguminous cover, or normal weed cover, in an Oil Palm plantation established on the site of high secondary forest. The forest stand was felled and burned before planting and the fertilizing effect of the nutrients thus returned to the soil was taken into account. The results emphasize the danger to soil fertility of long-term intercropping.

114.6. Soil Biology

See also Nos. 19, 474–5, 477.

27. MOORE, A. W., and ABAELU, J. N. **Non-symbiotic nitrogen fixation in a soil of the Nigerian rain-forest zone.** *Nature, Lond.* 184 (4679), 1959 (75). 2 refs.

Pot experiments with forest soil kept moist for 20 weeks showed significant increases in N in bare soil and bare soil to which glucose had been added, a decrease in pots mulched with wood shavings, and little change in pots growing grass or a legume, all compared with a dry pot. Since the soils of the rain forest zone carry growing plants almost continuously, it is unlikely that non-symbiotic N fixation is important agriculturally.

28. WENT, J. C. **Cellophane as a medium to study the cellulose decomposition in forest soils.** *Acta bot. neerland.* 8 (4), 1959 (490–1). 4 refs. [E.] O.B.D.

Cellophane (previously boiled to eliminate plasticizers) was folded round a microscope slide and kept in place by a second slide fastened at one end with adhesive tape. The slides were placed vertically in the soil and the development of fungi and bacteria, and the decomposition of the cellulose were followed. In order to identify the fungi, isolates were made from the newly invaded cellulose.

29. MEYER, J. Moisissures du sol et des litières de la région de Yangambi (Congo Belge). **[The moulds of soil and litter in the Yangambi region of the Belgian Congo.]** *Publ. Inst. Nat. Étude Agron. Congo Belge* (*Sér. sci.*) No. 75, 1959. pp. 211 + 4 plates. 98 refs. [F.] Price *Belg. Fr.*190.

Describes 251 species of Phycomycetes, Ascomycetes and Deuteromycetes, indicating author and reference of the original description, and giving the essential characteristics for each species.

30. MALISZEWSKA, W., and MOREAU, R. Sur la rhizosphère du sapin blanc (*Abies alba* Mill.). **[The rhizosphere of *A. alba*.]** *C.R. Acad. Sci., Paris* 249 (2), 1959 (303–5). 1 ref. [F.f.] O.R.S.

Studies were made on the flora of the whole soil and of the rhizosphere in Fir forest of different ages and vigour, comprising (1) self-sown seedlings (*a*) in the soil and (*b*) on stumps, mean age 5 years; (2) dominated trees; (3) trees of the main stand. The flora of the soil as a whole was poor. Bacteria and actinomycetes, but not fungi, were considerably more abundant in the rhizosphere, especially of (1*a*) and (1*b*).

31. MEYER, F. H. Untersuchungen über die Aktivität der Mikroorganismen in Mull, Moder und Rohhumus. **[Studies on the activity of micro-organisms in mull, moder and raw humus.]** *Archiv für Mikrobiologie, Berlin* 33 (2), 1959 (149–69). 45 refs. [G.g.] O.R.S.

The four types studied were (1) mull (dominant Beech, with Ash and Sycamore Maple); (2) moder (pure Beech); (3) moist raw humus (pure Beech); and (4) typical raw humus (dominant Beech, with Oak, Pine and Birch). The vegetation, soil profiles, acidity, and humus and N content of each are discussed. On all types, micro-organisms were present in only comparatively small numbers in the L (litter) layer and most abundant in the F_1 layer; on (1) and (2) they were also abundant in the F_2 and H layers, whereas in (3) and (4) they were considerably fewer (18 and 23% respectively of the values for F_1). The ratios of bacteria to mould fungi for the organic A layers were 22/1, 11/1, 8/1 and 0·9/1 on (1) to (4) respectively. The activity of the micro-organisms (their O consumption during decomposition of organic materials) was roughly the same for (2), (3) and (4) and rather higher for (1) in the L and F layers; it was lower for all types in the H layer but again highest in (1) followed in order by (2), (3) and (4) with values of 91, 46 and 24% of that in (1). Mycelia of saprophytic basidiomycetes in the F layer and leaves showing breakdown of lignin by these fungi were most abundant on (1).

32. BUBLITZ, W. Über organische Hemmstoffe und ihre Wirkung auf den Rohhumus. Ein Beitrag zum Problem der Bodenmüdigkeit unter Nadelholz. **[Organic inhibitors and their effect on raw humus. A contribution to the problem of 'soil sickness' in conifer stands.]** *Forstarchiv* 30 (6), 1959 (105–10). 29 refs. [G.]

The author summarizes horticultural research and theories on 'soil sickness' and recapitulates his earlier research on inhibiting substances in Spruce litter [cf. *F.A.* 15 No. 21; 17 No. 52] and reports on supplementary experiments. While newly cast, brown Spruce needles had no effect on bacterial growth when added whole to a nutrient medium, powdered needles had a marked inhibiting effect. Two needle extractives, separated chromatographically, were found to be very active, and one substance from a raw-humus extract even more so. There were indications that these substances may be terpenes or terpene derivates. Phenolic substances separated had no inhibiting effects. The effect of the raw-humus extract, and of the substances extracted, increased with decreasing pH. The role of such substances in the formation of raw-humus, interpreted as a special form of 'soil sickness', and the action of fertilizers, particularly lime and gaseous NH_3, in counteracting them are discussed.

114.7. Soil Surveys and Surveying

See Nos. 7, 36.

116. Hydrology. Water Conservation, Soil Conservation and Erosion

See also Nos. 9, 309, 349, 455, 458–60, 498, 502.

33. GLEASON, C. H. **Watershed management—an annotated bibliography of erosion, streamflow, and water yield publications by the California Forest and Range Experiment Station.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 23, 1958. pp. iii + 79 + 2 maps.

The main part comprises titles and notes on 204 papers, 1926–57; some important earlier papers and 3 translations by staff members are also listed.

34. REPPERT, J. N., and GREEN, L. R. **Annotated bibliography of publications from the San Joaquin Experimental Range.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 27, 1958. pp. 32.

Lists 135 papers, 1936–58, relating to range management and cattle grazing.

35. TRIMBLE, G. R., JR. **A problem analysis and program for watershed-management research in the White Mountains of New Hampshire.** *Sta. Pap. Nitheast. For. Exp. Sta.* No. 116, 1959. pp. 46. 19 refs.

36. GARLAND, L. E., PIERCE, R. S., and TRIMBLE, G. R., JR. **A soil survey of forest land.** *J. Soil Wat. Conserv.* 14 (5), 1959 (199–204). 6 refs.

Discusses the principles applied and data recorded in mapping 7500 acres of experimental catchment area in the White Mountains, N.H. Greater stress was laid on topographical factors than in the usual agricultural soil surveys, while texture, depth, drainage etc. were treated in less detail.

37. OGIHARA, S., and YAMAGUCHI, I. **[Application of hydrograph in expressing the hydrological characteristics of watersheds.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (101–41). 5 refs. [Jap.e.*e.*]

38. NYS, L. De l'influence des coupes à blanc en hydrologie forestière. **[The influence of clear felling in forest hydrology.]** *Bull. Soc. For. Belg.* 66 (8/9), 1959 (421–8). 4 refs. [F.]

Summarizes the results of observations in the Harz [cf. *F.A.* 20 No. 1392] on adjacent catchments, one clear felled and the other still carrying Spruce forest.

39. KREŠL, J. Vliv lesnatosti povodí na odtok. **[The influence of the forest cover % of catchments on run-off.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 5 (7), 1959 (673–94). 15 refs. [Cz.cz.russ.e.]

Analyses of run-off were made in 1954–56 on 8 catchments varying from 13·3 to 1086·8 ha. in size and from 12 to 100% in forest cover, the stands consisting mostly of single-storeyed Pine and Spruce mixtures. Results indicated that, in a year with precipitation close to the 20-year mean, run-off in litres/sec./sq.km. (q) decreased with increasing forest cover (l) according to the formula $q = 2{\cdot}77 + 0{\cdot}68\ l - 1{\cdot}53\ l^2$ for the period May–Oct., and $q = 4{\cdot}54 + 0{\cdot}59\ l - 2{\cdot}74\ l^2$ for the year. In a drier year the formulae were $q = 0{\cdot}71 + 6{\cdot}14\ l - 5{\cdot}55\ l^2$ and $q = 1{\cdot}76 + 5{\cdot}55\ l - 6{\cdot}05\ l^2$ respectively. Those catchments with ca. 50% forest cover had the smallest reduction of run-off in times of minimum flow. There was less daily fluctuation in flow rates from catchments with medium forest cover than from bare or fully forested ones. Accordingly, but subject to confirmation elsewhere, the optimum forest cover for catchments is thought to be ca. 50%.

40. **Relations between timber and soil moisture in the Piedmont.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1958*, 1959 (21–2).

When part of a 17-year Loblolly Pine stand with a b.a. of 150 sq. ft./acre was thinned to 75 sq. ft., the top foot of soil still held available moisture 15 days after it had reached wilting point in the control. After 30 days of drought, available water in the top 4 feet had fallen from 5·25 to 2·5 in. in the thinned, and to 1·5 in. in the control stand. Winter rains completely recharged the soil to a depth of 8 feet in the thinned, but to ≯ 4 feet in the unthinned stand. The difference in moisture levels has persisted over two growing seasons.

41. Burykin, A. M. Rol' drevesno-kustarnikovoj rastitel'nosti v ohrane počvy na Černomorskom poberež'e Krasnodarskogo kraja. [**The role of trees and shrubs in soil protection on the Black Sea coast of Krasnodar territory.**] *Počvoved.* 1959 (8), (104–12). 23 refs. [Russ.e.] A.P.B.

Sheet erosion caused by natural rain and by artificial rain at different intensities and for different periods was investigated on yellow, podzolic, heavy clay-loams on slopes of 12–25°, either arable or carrying forest or scrub. It was found that only in forest of density ⩾ 0·5, with a dense shrub layer and 4–7 tons of litter per ha., was there no surface run-off or sheet erosion. Data are tabulated showing the influence on erosion of forest density and composition, the shrub layer, the litter, and the stabilization of the soil by roots. The influence on erosion of spaces and holes in the soil (e.g. made by burrowing animals), the steady increase in the erodibility of the soil with each successive stage in the transition from forest to arable land, and subsurface run-off are discussed. Surface and subsurface run-off increased with increasing intensity of rain, and surface run-off increased rapidly with increasing duration of rain. Total sheet erosion in a forest without litter, a felled area, and on old ploughed land was as 1/21/159; on shrubby areas, areas cleared of shrubs, and on old ploughed land as 1/52/246. Tree and shrub species are recommended for catchment planting on (*a*) sunny slopes and eroded stony soils, (*b*) shady slopes, (*c*) landslips and boggy areas, and (*d*) banks of rivers and streams.

42. Cappuccini, G. **Report of research on methods of soil conservation and land use in high altitude watersheds, particularly in those sectors above the timber line.** [*Docum.*] *4th Sess. FAO European For. Comm. Wkg. Party on Torrent Control, 1958 Austria* No. *FAO/EFC/TORR.* 16, 1958. pp. 102. 43 refs.

Covers France, Greece, Poland, Rumania, Spain, Switzerland, Turkey, West Germany and Jugoslavia.

43. Morland, R. T. **Erosion survey of the Hume catchment area** (N.S.W.). **I–III.** *J. Soil Conserv. Serv. N.S.W.* 14 (3; 4), 1958 (191–225; 293–326); 15 (1), 1959 (66–99). 43 refs.

Parts I deals with physiography, geology, soils and climate, II and III describe the vegetation units of the higher (alpine grassland, high moor, alpine woodland, subalpine sclerophyll forest, and wet sclerophyll forest), and lower (dry sclerophyll forest, savanna woodland, tall woodland of *Eucalyptus rostrata*) parts of the catchment respectively.

44. Berben, J., *et al.* Recherches sur la fixation de sables volants en Campine. [**Research on the fixation of moving sands in Campine.**] *Bull. Soc. For. Belg.* 66 (6), 1959 (305–21 + 2 plates, 1 tbl.). 4 refs. [F.]

Describes studies made with a view to fixing an area of some 300 ha. of moving sands in the neighbourhood of Lanmel. The measures tested were: (1) establishment of a windbreak of faggots of Pine branches (from thinnings in neighbouring forests) to reduce wind velocity; (2) treatment of the ground thus protected with composted night-soil at 30 tons/ha.; (3) sowing of grasses and planting of a mixture of tree species. The success of (2) was shown on trial plots, which were colonized by various grasses and herbs while untreated control plots remained bare: soil pH was increased, and soil level raised by 0·2 m. compared with controls. The costs of the various measures are given, and data on establishment of a number of grasses, herbs and tree species, with and without (2), are tabulated.

45. L'vov, P. L. Sovremennoe sostojanie flory 'èolovoj pustyni' u podnožija Dagestana. [**The present condition of the flora of the 'aeolian desert' of lower Dagestan [near Makhachkala].**] *Bot. Ž.* 44 (3), 1959 (353–9). [Russ.russ.]

Describes the flora of the left bank of the river Shura-Ozen', with data on climate and phenology. Introduced *Robinia pseudoacacia* and *Ailanthus altissima* are growing well alongside the railway line, and some specimens of *Morus nigra*, *Gleditsia triacanthos*, *Acer negundo*, *Pyrus salicifolia*, *Sophora japonica*, *Fraxinus* spp., *Salix purpurea*, *Amorpha fruticosa*, *Populus* spp. etc. are also present.

14. Systematic Zoology

145.7. Insecta. Entomology

See also Nos. 681 *et seq.*, 1102–3, 1123 *et seq.*

46. ***Maconellicoccus hirsutus*** **(Green)** (= ***Phenacoccus hirsutus*** **(Green)**) **(Homopt., Coccoidea) (Hibiscus mealy bug).** *Distr. Maps Insect Pests* (*Ser. A*) No. 100, 1959. pp. [2].

47. ***Planococcus lilacinus*** **(Ckll.)** (= ***Pseudococcus lilacinus*** **(Ckll.)**) **(Homopt., Coccoidea).** *Distr. Maps Insect Pests* (*Ser. A*) No. 101, 1959. pp. [2].

48. Wittig, G. Morphologie und Entwicklung der Raupen des Tannentriebwicklers *Choristoneura murinana* (HB.) (Lepidopt., Tortricidae). I. Die Unterscheidung der Larvenstadien. [**Morphology and development of larvae of *C. murinana*. I. Differentiation of the larval instars.**] *Z. PflKrankh.* 66 (7), 1959 (401–9). 15 refs. [G.g.e.] E.M.B.

Investigations on head capsule width, number of crochets per pro-leg, and chaetotaxy. Larval instars can be differentiated primarily by head capsule width. *From author's summary.*

49. KOCHER, L. Contribution à l'étude des chrysomélides du Maroc. **[Contribution to the study of the chrysomelids of Morocco.]** *Mémoires de la Société des Sciences Naturelles et Physiques du Maroc, Rabat* (*Zoologie*) No. 5, 1958. pp. 82. [F.]

A revision of the Moroccan species.

50. MATHUR, R. N. **Immature stages of Indian Coleoptera (29) Cerambycidae.** *Indian For. Rec.* (*n.s.*) *Entomology* 9 (9), 1958 (175–81). 3 refs.

Describes larval and pupal stages of *Merionoeda phoebe*, *Exocentrus flemingiae*, and *Pterolophia persimilis*.

51. SCHEDL, K. E. **Indian bark and timber beetles II. 163. Contribution to the morphology and taxonomy of the Scolytoidea.** *Indian For. Rec.* (*n.s.*) *Entomology* 9 (8), 1959 (171–3).

Notes on *Dactylipalpus transversus*, *Hylesinus despectus*, *H. macmahoni* and *H. nilgirinus*, and detailed descriptions of *H. alternans* sp. nov. and *H. machilus* sp. nov.

52. SCHEDL, K. E. Borkenkäfer aus der Türkei. **[Barkbeetles of Turkey.]** *Anz. Schädlingsk.* 32 (7), 1959 (99–100). [G.]

Lists 12 host species with the barkbeetle species found, and the date and locality of the find.

53. ***Neodiprion sertifer*** **(Geoffr.) (Hymenopt., Tenthredinoidea) (European Pine sawfly (U.S.A.)).** *Distr. Maps Insect Pests* (*Ser. A*) No. 98, 1959. pp. [2].

54. ***Pristiphora erichsonii*** **(Htg.) (Hymenopt., Tenthredinidae) (Larch sawfly).** *Distr. Maps Insect Pests* (*Ser. A*) No. 97, 1959. pp. [2].

55. GÖSSWALD, K., and SCHMIDT, G. Zur morphologischen und biochemischen Differenzierung der Waldameisen (Hym. Form., Gen. *Formica*) und ihrer waldhygienischen Bedeutung. **[The morphological and biochemical differences of wood ants (genus *Formica*), and their importance for forest protection.]** *Waldhygiene* 3 (1/2), 1959 (37–46). 34 refs. [G.]

A discussion of the taxonomy of the genus, based largely on setation and paper chromatography, in which 7 main groups are provisionally distinguished. *F. rufopratensis minor*, the polygynous form favoured for artificial propagation, is included in the *F. polyctena* group.

15. Animal Ecology. Game and Fish Management, Hunting, Shooting and Fishing

See also Nos. 665 *et seq.*, 1252, 1295.

56. SMITH, R. L. **Abundance of small mammals in conifer plantations.** *J. Mammal.* 40 (2), 1959 (253–4). O.R.S.

Traps were set out in Sept. 1955 in neighbouring plantations of pure Jack Pine, Scots Pine, Larch and Balsam Fir plantations, the first 3 planted in 1939. *Peromyscus leucopus* and *Blarina brevicauda* were more abundant in the Jack Pine and Larch plantations, where there was considerable ground cover, than in the Scots Pine where it was sparse or lacking. Few mice and shrews were caught in the Balsam Fir plantations, possibly because of trap robbing by predators, but signs of small mammals were abundant. General observations in 60 plantations indicated that small mammals were more abundant in plantations with good moss and herbaceous ground cover than in those with only a heavy needle litter.

57. LOCHMAN, J., FIŠER, Z., and HANUŠ, V. Příspěvek k řešení otázky přirozené potravy srnčí zvěře. **[The natural food of roe deer.]** *Sborn. Čsl. Akad. Zeměd.* (*Lesn.*) 5 (7), 1959 (723–50). 12 refs. [Cz.cz.russ.g.]

On an 878-ha. area, mainly belonging to the *Querceto-Carpinetum*, stomach analyses showed the order of importance to be *Quercus sessiliflora*, *Ligustrum vulgare*, *Carpinus betulus*, *Pinus sylvestris*, *Trifolium medium*, *Picea abies*, etc. Tree material formed 61·52, shrubs 16·32, weeds 2·26, grasses 4·83, fungi 1·3, and agricultural crops 13·76% of the diet.

58. BATEMAN, B. A. **Value of hardwoods in forest game habitat in Louisiana.** *LSU For. Notes La. Agric. Exp. Sta.* No. 31, 1959. pp. 2. 3 refs.

Includes a table showing for 25 species their relative food value for squirrels, deer, turkeys and quail.

59. MILTON, O. **A project for a wildlife conservation survey of Burma with special reference to the status of endangered species.** *Burmese For.* 8 (2), 1958 (107–15). 28 refs.

Points out the need for an immediate survey of the status of *Rhinoceros sumatrensis* and *R. sondaicus* in S.E. Asia, with particular reference to Burma.

16. General Botany

160. Plant Chemistry

See also Nos. 24, 121, 178, 232–6, 264–5, 303, 621, 975 *et seq.*, 1195 *et seq.*

60. WEHRMANN, J. Methodische Untersuchungen zur Durchführung von Nadelanalysen in Kiefernbeständen. **[Investigations on methods of making needle analyses in Pine stands.]** *Forstwiss. Cbl.* 78 (3/4), 1959 (77–97). 56 refs. [G.g.]

Discusses and graphs the changes in the amounts and concentrations of N, P, K, Ca, and Mg in Pine needles during a growing season; the scatter of nutrient concentrations in the needles of different trees in the same stand, both for different classes of trees and for the same class; the annual fluctuations of nutrient concentrations in the needles, and the dependence of the nutrient concentrations in the needles on the age of the stand. From these findings, and from the literature, it is concluded that for an assessment of the N, P, K, Mg, and Ca nutrient status of Pine stands by means of needle analysis, the needle samples must be taken between the end of Sept. and the end of Nov. The needles analysed must also be comparable: in the author's investigations, the youngest needles from the uppermost side shoots were analysed. The needles must come from trees of the same 'social class', if possible from dominants. For N and P analyses, needle samples should be taken from ca. 10 trees at

each site, to ensure reliable mean values; for K and Mg, from ≮ 30 trees; and for Ca analyses, from ca. 100 trees. Measurements should be made over several years, as annual fluctuation could cause a faulty diagnosis if a single year's measurements were used.

61. PARŠEVNIKOV, A. L. Izmenenie zol'nogo sostava hvoi s vozrastom v nekotoryh tipah elovyh lesov. **[The change in the ash content of needles with age in some types of Spruce forests.]** *Bot. Ž.* 44 (2), 1959 (228–31). 10 refs. [Russ.]

Tabulates the contents of crude ash, SiO_2, Al_2O_3, Fe_2O_3, MnO, CaO, MgO, K_2O, P_2O_5, SO_3, and N, in % of oven-dry weight, for Spruce needles aged 1, 3, 5 and 8 years, and for needle litter, in (*a*) the *Piceetum myrtillosum*, and (*b*) the *P. herbosohylocomiosum*. In (*a*) and (*b*) the ash content increased with age, owing to the accumulation of SiO_2 and CaO; the MnO and SO_3 contents also showed some increase, but the K_2O, P_2O_5 and N contents fell with age. Needles from (*b*) had higher CaO, P_2O_5 and N, but lower SiO_2 and MnO contents than those from (*a*). Litter had more SiO_2 and CaO, and less K_2O, P_2O_5, MgO, N, and SO_3 than living needles. No regular trends could be observed in the changes in Al_2O_3, Fe_2O_3 or MgO contents with either needle age or forest type.

62. KORNEV, V. P. Nakoplenie v list'jah derev'ev i kustarnikov fosfora i kalija i vymyvanie ih iz opada za osenne-zimnij period. **[The accumulation of P and K in the leaves of trees and shrubs, and their leaching from the litter in autumn and winter.]** *Počvoved.* 1959 (4), (87–94). 7 refs. [Russ.e.] A.P.B.

During 1955–57, samples of foliage of numerous species in a nursery and in Pine plantations 32, 36 and 44 years old were gathered and analysed. Litter samples were also analysed immediately after leaf-fall and in the following spring, just when tree growth recommenced. Full data on P and K contents of the foliage and litter are tabulated. The P and K requirement at the start of the growing season was high. Thereafter, some K migrated to other organs of the plants, and ≯ 50% of the K accumulated in the spring was returned to the soil by leaf-fall. The amounts of P in the leaves in autumn were the same as in spring. Leaching during autumn and winter reduced the K content of litter by ca. 78–94%, and the P content by ca. 63–92%.

63. JÁRÓ, Z., and HORVÁTH, S. Egyes tápanyagok mennyiségének idöszaki változása erdei fáink leveleiben. **[Periodical changes of some nutrients in the leaves of hardwoods.]** *Erdész. Kutatás., Budapest* 1958 (3/4), (153–79). [Hu.hu.russ.e.g.*russ.g.*]

Graphs the fluctuations in N, P, K, and crude ash content of leaves collected at monthly intervals (June-October, 1957) from 13 species (of *Quercus*, *Populus*, *Robinia*, *Fagus*, *Carpinus*, and *Tilia*) in Hungary. The nutrient contents of the leaves were found to depend mainly on the nutrient status of the soil. Comparison of the nutrient content curves for different species is thought to be a sound basis for deciding on the composition of mixtures.

64. PURI, G. S. **Nitrogen content of leaves of some exotic and indigenous forest tree species planted at New Forest [Dehra Dun].** *Indian For.* 85 (7), 1959 (426–30). 2 refs.

Gives tabulated data on N content of leaves of 108 species. Gymnosperms have the lowest N contents; *Pongamia pinnata* and *Alnus nepalensis* are richest in N.

65. MASLOVA, T. G. Izvlekaemost' hlorofilla petrolejnym ėfirom iz list'ev rastenij raznyh sistematičeskih grupp. **[The extractability of chlorophyll by petroleum ether from the leaves of plants in different taxonomic groups.]** *Bot. Ž.* 44 (3), 1959 (389–94). 16 refs. [Russ.]

Investigates changes in the chlorophyll-protein-lipoid complex of leaves with age. Chlorophyll extractability was greater for young leaves than for old in 9 species, less in 2 species, and in 2 species there was no significant difference. In 1-, 2-, and 3-year-old leaves from 11 evergreen species, extractability was greater for older than for younger leaves in 7 species, there being no significant difference in the other 4. Chlorophyll content per unit of air-dry leaf weight increased from the most ancient gymnosperms (Araucariaceae) to the more advanced angiosperms (Leguminosae) [following Tahtadžan's phylogenetic arrangement]. Extractability was highest in the most ancient (*Araucaria* spp. 100%) and least in the most recent (*Juniperus* spp. 60–40%) gymnosperms; in angiosperms it ranged from 93% in *Thea sinensis* to 20% in *Phyllostachys edulis*.

66. GERHOLD, H. D. **Seasonal variation of chloroplast pigments and nutrient elements in the needles of geographic races of Scotch Pine.** *Silvae Genet.* 8 (4), 1959 (113–23). 66 refs. [E.e.f.g.]

Chloroplast pigments and nutrient elements in needles of 6 geographic races of Scots Pine were analysed in relation to seasonal discoloration. Chlorophylls *a* and *b* and total carotenoids were determined by spectrophotometry. N was determined chemically; P, K, Ca, Mg, Fe, Mn, Cu, and B were determined simultaneously by spectrographic analysis. Discoloration is caused primarily by the loss of chlorophyll, and partly by an increase in carotenoids. A regression of needle colour on chloroplast pigments accounted for 88% of the variability. In August the total chlorophyll in 2 Scandinavian races was higher than in races from central Europe, whereas in February the opposite was true. Carotenoids were higher in February than in August in all the races, with no racial differences. Many significant effects of races and seasons on levels of the 9 elements in the needles were noted and are large enough to warrant careful consideration in sampling for foliar diagnosis of Scots Pine. No connexion, however, could be established between pigments and elements that could account for any appreciable discoloration. Foliar applications of liquid fertilizers had no apparent effect on needle colour. It is concluded that seasonal discoloration in Scots Pine is not caused by a deficiency of any of the 9 elements analysed. *From author's summary.*

67. CUMMINGS, M. M., and HUDGINS, P. C. **Chemical constituents of Pine pollen and their possible relationships to sarcoidosis.** *American Journal of the Medical Sciences, Philadelphia* 236 (3), 1958 (311–7, 329). 9 refs. [E.e.interlingua] L.S.

Investigations of forest products, prompted by the observation of a correlation between distribution of this lung disease and forest distribution in the U.S.A., indicated that Pine pollen resembles tubercle bacilli in chemical composition and that pollen or pollen fractions produce suggestive symptoms on injection. An acid-fast lipid, and an amino acid with the characteristics of α-ε-diamino pimelic acid were found. Pollen from various hardwoods showed no acid-fast properties, but two other gymnosperms, Ginkgo and a Larch, did.

68. BROOKER, E. G. **Constituents of *Phyllocladus glaucus*.** *N.Z. J. Sci.* 2 (2), 1959 (212–4). 12 refs.

Phyllocladene has been isolated from the leaves, and acetic and ferulic acid esters of the bimolecular compound of ceryl and lignoceryl alcohols have been obtained from both the root and aerial barks. *From author's summary.*

69. KRUGMAN, S. L. **The leuco-anthocyanin distribution in the genus *Pinus*.** *For. Sci.* 5 (2), 1959 (169–73). 12 refs.

[Cf. *F.A.* 18 No. 2466.] The needles, bark, and wood of 38 species and 6 hybrids of Pine, and also the roots and pollen grains of some of the species, were analysed for the presence of leuco-anthocyanins (l.a.). The latter were detected in all the Pines, but content varied with the part of the tree examined. The needles and bark of all species contained l.a. which yielded both cyanidin and delphinidin on acid hydrolysis, but roots and stem wood contained l.a. that yielded cyanidin only. No l.a. were detected in pollen grains.

70. GANGULY, A. K., SESHADRI, T. R., and SUBRAMANIAN, P. **A study of leucoanthocyanidins of plants—I. Isomers of leucodelphinidin from Karada [*Cleistanthus collinus*] bark and *Eucalyptus* [*pilularis*] kino.** *Tetrahedron, Lond.* 3 (3/4), 1958 (225–9). 4 refs. [E.e.] O.R.S.

71. GANGULY, A. K., and SESHADRI, T. R. **A study of leucoanthocyanidins of plants. II. (+) Leucocyanidin from the gum of *Butea frondosa*.** *Tetrahedron, Lond.* 6 (1), 1959 (21–3). 3 refs. [E.e.] O.R.S.

The leucocyanidin is 5:7:3′:4′-tetrahydroxyflavan-3:4-diol.

72. HILLIS, W. E. **Shikimic acid in the leaves of *Eucalyptus sieberiana* F. Muell.** *J. exp. Bot.* 10 (28), 1959 (87–9). 10 refs. O.B.D.

Shikimic-acid (s.a.) content was determined in leaves at different stages of growth, taken from 1- and 4-year-old specimens of *E. sieberiana*. A linear relationship was found between the s.a. concentration (mg./g.) and the weight of the leaf up to the point where the leaf had reached full size. As the leaves became older the s.a. content decreased. *From author's summary.*

73. SWAIN, T., and HILLIS, W. E. **The phenolic constituents of *Prunus domestica*. I. The quantitative analysis of phenolic constitutents. II. The analysis of tissues of the Victoria plum tree.** *Reprs.* from *J. Sci. Food Agric.* 10 (1; 2), 1959 (63–8; 135–44). 29 refs.

(I) Examines analytical methods and suggests modifications. (II) Presents results of a study on seasonal variations and distribution in leaves, wood and bark of total phenols, *leuco*-anthocyanins and flavanols. [Cf. *F.A.* 18 No.2468.]

74. CRONENBERGER, L. Évolution de quelques constituants chimiques des bourgeons de merisier (*Prunus avium*). **[The evolution of some chemical constituents of buds of *P. avium*.]** *C.R. Acad. Sci., Paris* 249 (3), 1959 (475–7). 2 refs. [F.f.] O.R.S.

Includes tabulated results of measurements of contents of amino acids and sugars at various periods from 3 Oct. to 23 Feb.

75. CAIN, B. F., and CAMBIE, R. C. **Leaf extractives of *Pomaderris elliptica* Labill.** *N.Z. J. Sci.* 2 (2), 1959 (240–3). 7 refs.

Flavonols present as the free compounds and as glycosides have been identified as kaempferol and quercetin by isolation and by paper chromatography. An aliphatic ester isolated as the major fraction by chromatography of a light petroleum extract has been identified as myricyl acetate. *From authors' summary.*

76. DÄSSLER, H.-G., and MAYER, R. Vorkommen von Himbeeraromastoffen im wässrigen Extrakt von Blättern des Spitzahorns (*Acer platanoides*). **[The occurrence of substances with the aroma of raspberries in aqueous extracts of leaves of *A. platanoides*.]** *Naturwissenschaften* 46 (14), 1959 (448–9). 6 refs. [G.] O.R.S.

The extract from young leaves smelt and tasted strongly of raspberries. None of the substances so far identified (e.g. various acids, glucose, mannit, methylamine, iso-amylamine) has a similar taste or smell.

77. SZALAI, I., and GRACZA, L. **Quantitative distribution and changes of the free tryptophan in the twigs of the Ash.** *Phyton, Buenos Aires* 11, 1958 (111–4). [E.] From *abstr.* in *Chem. Abstr.* 53 (11), 1959 (10391). P.R.

The apparent formation of IAA from tryptophan (t.) prompted the present study, in which twigs from a single *Fraxinus excelsior* specimen were sampled in autumn, mid and late winter, and early, mid and late spring. Samples of the terminal and 3 successive lateral buds and of the bark were analysed for t., the free t. content of the buds increasing as they swelled but that of the bark declining in such close inverse ratio as to suggest that the buds obtained their t. from the bark. At the last sampling, the buds had begun florescence and were not sampled; the t. content of the unopened terminal bud and of the bark had become quite small, less than at the mid-winter sampling.

161. Physiology

See also section 181 and Nos. 66, 77, 97, 117–8, 123, 135–7, 391, 393–5, 508, 757, 936, 1109–14.

78. MARSHALL, D. C. **Measurement of sap flow in conifers by heat transport.** *Plant Physiol.* 33 (6), 1958 (385–96). 8 refs. O.R.E.

An expanded version of work already noticed [see *F.A.* 20 No. 1429].

79. PISEK, A., and WINKLER, E. Licht- und Temperaturabhängigkeit der CO_2-Assimilation von Fichte (*Picea excelsa* Link), Zirbe (*Pinus cembra* L.) und Sonnenblume (*Helianthus annuus* L.). **[Light and temperature relationships of CO_2 assimilation in Spruce, *Pinus cembra* and sunflower.]** *Planta* 53 (5), 1959 (532–50). [G.g.] O.B.D.

Tests were made at 3 light intensities:—(1) 3000, (2) 10,000 and (3) 30,000 luxes. With the conifers the following results were obtained: relationship of net assimilation to temperature gives a simple curve, the peak of which rises with intensity of illumination within the range studied. Point of optimum assimilation generally shifts with rising light intensity and temperature, e.g. with sun leaves of Spruce in the Innsbruck Botanical Garden it shifted from 11 to 18° C. when light intensity rose from (1) to (3). In trees from the timberline the optimum was reached ca. 3° lower with Spruce and ca. 2° lower with *P. cembra*. Maximum, as distinct from optimum, values for net assimilation also shift in the same way, at least with the transition from (1) to (2), and were reached in (2) at ca. 36–38° C. At 30° C., net assimilation is markedly affected, especially at low light intensities and especially in trees from high altitudes. This is entirely due to the fact that respiration at high temperatures rises steeply with temperature. Total photosynthesis remains level within the range 15–30°. Relatively good assimilation can be obtained at low illuminations even with low temperatures, but the highest values are only attained with high illumination; at (3) it amounts to ca. 2·5–3 mg./g. dry weight of leaf/hr. Shade leaves at all illuminations had higher values than sun leaves. In comparison, assimilation was much higher in sunflower, reaching under favourable conditions ca. 60 mg. CO_2/g. dry weight of leaf/hr.

80. NEUWIRTH, G. Der CO_2-Stoffwechsel einiger Koniferen während des Knospenaustriebes. **[The CO_2-metabolism of some conifers during bud-break.]** *Biol. Zbl.* 78 (4), 1959 (559–84). 12 refs. [G.g.] E.M.B.

Measurements of assimilation and respiration were made on twigs of young *Picea abies*, *Pseudotsuga taxifolia* and *Pinus sylvestris* from both early- and late-flushing individuals. In all three species at the beginning of flushing, respiration rate exceeded that of assimilation, so that the CO_2 balance was negative. The extent of the deficit depends on the phase of flushing, external factors having only a secondary influence. Although, in general, respiration rate exceeds assimilation rate in every phase of flushing, the compensation point can quickly be reached and passed. The balance is therefore highly unstable during spring flushing. After the first phase of shoot development, there follows a more or less marked fall in the assimilation and respiration rates, probably due to the excessive demands made upon the older organs of assimilation. When the new shoots begin to lengthen, a rise in the CO_2 exchange rate takes place and the functioning of the new leaves leads to a marked excess of assimilation over respiration. For normal flushing not only is the full complement of old needles necessary, but reserve substances in the wood are also called upon. If the old needles are removed, the young shoots suffer a depression of growth accordingly.

81. BELOSTOKOV, G. P. O morfologičeskoj cikličnosti rosta godičnyh pobegov drevesnyh rastenij. **[Cyclic morphological changes in the growth of annual shoots of woody plants.]** *Dokl. Akad. Nauk SSSR* 126 (3), 1959 (682–3). 5 refs. [Russ.] A.P.B.

A polemical article, refuting Krenke's theory that a cycle of senescence and rejuvenescence occurs within the annual shoot. The cyclic changes, e.g. in internode length, are caused by changes in the activity of the growing point, representing hereditary responses of the plant to its environment.

82. PARKE, R. V. **Growth periodicity and the shoot tip of *Abies concolor*.** *Amer. J. Bot.* 46 (2), 1959 (110–8). 40 refs. O.B.D.

The terminal shoot of *A. concolor* shows a marked seasonal activity or growth periodicity of the meristematic regions. Three growth phases can be distinguished in the yearly sequence of development: the rest phase, during which the fully formed telescoped shoot remains in a state of suspended growth; the first growth phase, during which the telescoped shoot elongates rapidly and gives rise to numerous cataphylls; and the second growth phase, during which shoot elongation is completed and a new unelongated axis bearing many needle primordia is formed. The shoot tip consists of 4 clearly definable cytohistological zones; the apical initials, the sub-terminal mother cells, the peripheral zone, and the zone of central tissue. Although the shape of the shoot tip and the volume of the zones both change during the growth sequence, the basic zonation pattern remains. *From author's summary.*

83. DAHL, E., and MORK, E. Om sambandet mellom temperatur, ånding og vekst hos gran (*Picea abies* (L.) Karst.). **[The relationships between temperature, respiration and growth of Spruce.]** *Medd. Norske Skogforsøksv.* 16 (1), No. 53, 1959 (81–93). 9 refs. [Nor.e.*e.*]

Summarizes the results of studies at Hirkjølen already published [see Mork, *F.A.* 4 p. 134], and discusses the physiological mechanism responsible. In 1958, Spruce branches were kept in the dark at temperatures of 0, 6, 12, 18, 26 and 30° C. and respiration measurements were made at intervals throughout 18 hr.; the respiration figures proved to be similar to those for Spruce in Austria [cf. *F.A.* 20 No. 110] and to those from measurements on peas in the Netherlands in 1910. Respiration at 0, 6, and 12° remained constant throughout the 18-hr. period, but at 18° and 30° it fell, reaching 65% of the

original by 17 hr. at 18°, and 67% by 6 hr., and 50% by 18 hr. at 30°. The respiration equivalent (Re), a measure of respiration during 24 hr. ($Re = \int T R_T dt$, where t is time, T temperature as a function of time, and R_T the relative respiration at T when respiration at 10° is calculated as 1), was calculated for the material of the earlier experiments, for each day during the summers of 1935, 1937 and 1940, and a nearly linear relationship was found between Re and daily growth (during the second growth phase, i.e. that in which growth was at its optimum and did not vary with time), expressed as a % of the height growth of the current year. A regression equation $y = 0{\cdot}127\,Re - 1{\cdot}19$, where y = growth %, is derived. It is concluded that, apart from a certain basic respiration necessary before growth starts, daily shoot elongation during the second growth phase at Hirkjølen was in proportion to respiration and limited by it or some closely related factor. Re was determined on the Hirkjølen material for 5-day periods and the expected growth was calculated from the regression equation; the observed growth was taken as a % of the expected growth and the results are given in graphs, clearly showing the 3 growth phases, (1) during early summer, in which growth increases with time, (2) in mid-summer when it is at its height and remains constant and (3) in late summer when it decreases.

84. MONK, C. D. **Note on radial tree growth.** *Bull. Torrey Bot. Cl.* 86 (3), 1959 (199–201). 5 refs. O.B.D.

Two types of process are involved in spring growth, (1) without cell division, usually occurring in phloem and related to water uptake by tissue dehydrated in autumn and winter, and (2) with cell division, as a result of cambial activity. Field observations showed that there is an interval of 14 days between (1) and (2) in *Acer saccharum* and of 10 days in *Fagus grandifolia.*

85. BRIAN, P. W., PETTY, J. H. P., and RICHMOND, P. T. **Extended dormancy of deciduous woody plants treated in autumn with gibberellic acid.** *Nature, Lond.* 184 (4679), 1959 (69). 2 refs.

[Cf. *F.A.* 20 No. 2779.] Gibberellic acid (g.a.) was sprayed on to plants as a 50 μg./ml. aqueous solution, 15 weekly applications being made between mid-August and late November 1958. Little or no after-effect was noticed when growth recommenced in the spring in the following species: *Acer rubrum, Castanea sativa, Parthenocissus tricuspidata,* a *Rhododendron* × *molle* cultivar, *Taxodium distichum* and *Ulmus procera.* Bud-break was delayed by 1–3 weeks in the following species: *Acer pseudoplatanus, Betula verrucosa, Fagus sylvatica, Fraxinus excelsior* and *Sorbus aucuparia.* In *Liriodendron tulipifera* bud-break was more or less simultaneous on treated and untreated branches, but leaf expansion was much slower on the treated branches. The most striking effects were seen on *Prunus avium.* Here g.a. had little effect on purely vegetative buds, but flower buds were profoundly affected. Most flower buds remained completely dormant and many were dead. Of the species showing prolonged dormancy, one (*F. sylvatica*) showed no response to g.a. in the previous autumn. Thus prolongation of dormancy is not necessarily a consequence of, or associated with, delayed onset of dormancy in the autumn.

86. SETH, S. K., and MATHAUDA, G. S. **Preliminary trials with gibberellic acid.** *Indian For.* 85 (9), 1959 (528–32 + 13 photos, 2 gphs.). 2 refs.

Results of two trials conducted at New Forest [Dehra Dun] during 1958 with the object of studying the effect of gibberellic acid on tree seedlings are described. The species experimented upon [*Quercus incana, Shorea robusta, Dalbergia sissoo, Pinus roxburghii, Dendrocalamus strictus, Michelia opaca, Albizzia lebbeck, Tectona grandis, Mesua ferrea, Pinus brutia, Pongamia pinnata, Mallotus philippinensis* and *Syzygium cumini*] have shown considerable variation in their response to the treatment. In a majority of cases height growth was accelerated, the stronger solutions generally giving greater height growth. Very rapid growth, however, produced undesirable traits associated with etiolation and was also accompanied by reduced root development. With weaker solutions the plants were apparently quite healthy and possessed well developed root systems. *From authors' summary.*

163. Embryology

See also No. 260.

87. ILLIES, Z. M. Weitere Mehrlingsuntersuchungen bei *Picea abies* (L.) Karst. [**Further investigations into polyembryony in *P. abies*.**] *Silvae Genet.* 8 (4), 1959 (111–3). 3 refs. [G.g.e.f.]

Presents the results of investigations into progenies resulting from controlled crossings and from freely pollinated *P. abies* progenies that were characterized by a varying % of polyembryonic seeds. The influence of the mother tree is of decided significance in the development of polyembryony. This is confirmed by the occurrence of morphologically distinct types of polyembryony when different mother trees were used. No influence of the father tree or of the environment could be found, nor was there any connexion between the occurrence of seedlings with aberrant chromosomal numbers and the degree of polyembryony [cf. *F.A.* 14 No. 1939]. *From author's summary.*

88. HÅKANSSON, A. **Seed development of Pine grafts.** *Bot. Notiser* 112 (1), 1959 (65–72). 6 refs. [E.] O.B.D.

Presents the results of X-ray examinations and germination tests to study the embryological development of seed during summer and early autumn on grafts from different localities in middle and northern Sweden. In certain northern collections the embryo was fully differentiated but small; the seed likewise was small. On certain grafts fertilization was delayed. In such cases the archegonia may not be ready to be fertilized. More or less delay was observed on several northern grafts, but was also observed in certain grafts from more southern provenances. A variation was observed in the number of archegonia in the ovule. In northern graft trees their number was frequently increased.

89. RAO, C. V. **Contributions to the embryology of Palmae. II. Ceroxylineae.** *J. Indian Bot. Soc.* 38 (1), 1959 (46–75 + 1 plate). 4 refs. O.B.D.

Deals with the structure of the inflorescence and flower, organogenesis, microsporogenesis, pollen structure, megasporogenesis, and development and structure of the embryo sac, endosperm, embryo and seed in 11 species. *From author's summary.*

90. DANG-VAN-LIEM. Embryogénie des Buxacées. Développement de l'embryon chez le *Buxus sempervirens* L. **[Embryogeny of the Buxaceae. Development of the embryo in *B. sempervirens*.]** *C.R. Acad. Sci., Paris* 248 (12), 1959 (1844–7). 9 refs. [F.f.] O.R.S.

B. sempervirens was found to be of the same embryonic type as *Geum urbanum*; no similarity to the Euphorbiaceae was found.

164. Morphology

See also Nos. 81–2, 116, 119–20, 131, 159.

91. CODACCIONI, M. Étude phyllotaxique des jeunes plants de quelques Cupulifères. **[Studies of phyllotaxy in seedlings of some Cupuliferae [*Quercus robur, Q. cerris, Castanea* sp., *Corylus avellana* and *Fagus sylvatica*].]** *C.R. Acad. Sci., Paris* 248 (22), 1959 (3202–4). 2 refs. [F.f.] O.R.S.

92. LOISEAU, J.-E., and HOTTEN, A.-M. Sur la phyllotaxie et les anomalies des rameaux végétatifs de l'orme (*Ulmus campestris* L.). **[Phyllotaxy and anomalies in the vegetative branches of Elm.]** *C.R. Acad. Sci., Paris* 248 (19), 1959 (2785–7). 7 refs. [F.f.] O.R.S.

93. JENTYS-SZAFEROWA, J. **A graphical method of comparing the shapes of plants.** *Repr.* from *Review of the Polish Academy of Sciences* 4 (1), 1959 (9–37 + 2 plates). 22 refs. [E.]

Describes and illustrates the author's method of representing shapes by graphs that show % differences of a number of characters from a norm (e.g. a mean) and its application to taxonomic analysis [cf. *F.A.* 13 No. 106], variations within a species, morphology, palaeobotany, etc.

94. KAMMEYER, H. F. Ein zweiter Ginkgo mit Tschitschi-Bildung gefunden! **[A second Ginkgo with chi-chi formations found [in Germany].]** *Mitt. Dtsch. Dendrol. Ges.* No. 60, 1957/58 (1959), (85–6 + 1 plate). [G.]

A record of chi-chi ('warts' or outgrowths on the underside of older branches) on a tree in Görlitz near Dresden, this being only the second time the phenomenon has been noted in Germany.

95. ARNOTT, H. J. **Anastomoses in the venation of *Ginkgo biloba*.** *Amer. J. Bot.* 46 (6), 1959 (405–11). 23 refs. O.B.D.

96. GEGOV, A. Morfologičeska sǎštnost na iglite na predstavitelite ot roda *Pinus* L. **[Needle morphology in representatives of the genus *Pinus*.]** *Nauč. Trud. Lesoteh. Inst., Sofia* No. 6, 1958 (91–108). 16 refs. [Bulg.g.]

Investigation of the anatomy of long and short shoots, buds and needles, of several species belonging to both subgenera of *Pinus* leads the author to conclude that the needles are metamorphosed short shoots which have gone over completely to the function of assimilation.

97. KLEŠNIN, A. F., and ŠUL'GIN, I. A. Ob optičeskih svojstvah list'ev rastenij. **[The optical properties of plant leaves.]** *Dokl. Akad. Nauk SSSR* 125 (5), 1959 (1158–61). 11 refs. [Russ.] A.P.B.

From investigations on ca. 80 plant species (including 15 tree species), graphs the reflection, transmission and absorption of radiant energy by leaves for different parts of the spectrum. The spectral curves were very close for all the species, irrespective of their systematic and ecological position and different conditions of growth.

98. BARTKOWIAK, S. Przysadki kwiatowe u topoli sekcji *Leuce* Duby. **[Bracteoles in Poplars of the section *Leuce*.]** *Arboretum Kórnickie, Poznań* No. 3, 1957/1958 (221–36). 8 refs. [Pol.e.russ.]

Describes, with illustrations, the differences in the shape of bracteoles of ♂ and ♀ flowers of *Populus alba, P. tremula, P. canescens* and *P. tremuloides.*

99. SINHA, S. C., and JOSHI, B. C. **Vascular anatomy of the flower of *Punica granatum* L.** *J. Indian Bot. Soc.* 38 (1), 1959 (35–45). 25 refs. O.B.D.

100. NAIR, N. C., and JOSH, R. K. **Floral morphology of some members of the Simaroubaceae.** *Bot. Gaz.* 120 (2), 1958 (88–99). 31 refs. O.B.D.

Deals with *Ailanthus excelsa, A. malabarica, A. grandis, A. glandulosa, Picrasma quassioides* and *Brucea sumatrana.*

101. HIGGINS, D. J., and ARISUMI, T. **Time of floral differentiation in *Ulmus americana, U. pumila*, and *U. carpinifolia*.** *Bot. Gaz.* 120 (3), 1959 (177–80). 3 refs. O.B.D.

Reports observations on the time of floral differentiation in these species in stained sections of buds collected during two growing seasons in Columbus, Ohio.

102. YAMAZAKI, T., and TAKEOKA, M. **[Electron microscope investigations on the surface structure of the pollen membrane based on the replica method. IV.]** *Sci. Rep. Saikyo Univ. (Agric.), Kyoto* No. 10, 1958 (28–36). 6 refs. [Jap.e.*e.*]

Describes and gives photomicrographs of pollen of *Populus nigra* var. *italica, Salix babylonica, Corylus sieboldiana, C. heterophylla, Betula papyrifera, Alnus japonica, A. pendula*, and *Celtis sinensis* var. *japonica.*

103. NEKRASOVA, T. P. Morfologija pyl'cy *Pinus silvestris* L. ssp. *lapponica* Fr. **[Pollen morphology of *P.s.* subsp. *lapponica*.]** *Bot. Ž.* 44 (2), 1959 (232–4). 3 refs. [Russ.]

Comparison of the shape and dimensions of (*a*) *P.s.* subsp. *lapponica* with (*b*) *P. sylvestris* pollen showed that (*a*) was slightly smaller. It is considered that *lapponica* should be considered as a geographical form of *P. sylvestris.*

104. ERDTMAN, G. **On spinuloid processes in pollen grains of the Betulaceae and Juglandaceae.**

Bot. Notisser 112 (2), 1959 (176–8 + 3 plates). [E.] O.B.D.

Photomicrographs show the presence of spinuloid processes in pollen grains of *Alnus glutinosa*, *A. incana*, *Betula pubescens*, *B. verrucosa*, *B. nana* and *Carpinus betulus*.

105. MARIĆ, B. Prilog poznavanju crnog bora sa krečnjačkih litica istočne Srbije. [**On *Pinus nigra* from limestone cliffs in eastern Serbia.**] *Šumarstvo* 12 (1/2), 1959 (49–56). 9 refs. [Serb.e.f.]

A study was made of cone morphology and seed quality, based on a sample of 90 cones from trees growing in cliff crevices near Zlot, Eastern Serbia, where *P. nigra* occurs in complete isolation from its main range in Western Serbia. Cone dimensions and contents as shown in serial sections, seed size and germinative capacity, are tabulated. Compared with data for W. Serbian trees [cf. *F.A.* 16 No. 2772], the cones were shorter and narrower, and contained very few seeds (averaging only 8·3 seeds per cone), of very variable size and low germinative capacity. In view of the possible interest of this form, probably adapted to severe environmental conditions, and of its poor seed production under natural conditions, the author recommends the establishment of seed orchards.

106. BRAYSHAW, T. C. **Tree seedlings of Eastern Canada**. *Bull. For. Br. Can.* No. 122, 1959. pp. 38. [E.F.]

Gives photographs showing different stages of seedlings of 12 conifers (including 2 introduced species—*Pinus sylvestris* and *Picea abies*) and 23 deciduous species (including *Acer platanoides*), and a key to the native coniferous seedlings.

107. ZYNGIER, F. C. Diferenciación de especies de *Eucalyptus* al estado de plántula. [**The identification of *Eucalyptus* spp. at the plantule stage.**] *Rev. for. argent.* 3 (2), 1959 (46–53). [Span.]

Describes briefly, for diagnostic purposes, the size, shape and dimensional relationships of the cotyledons and the first pair of leaves of 24 species of *Eucalyptus* and presents a key based on their characters.

165.3/.7. Heredity, Genetics and Breeding; Variation

See also Nos. 66, 87–8, 105, 159, 195, 205, 208, 217, 271, 323, 359, 363–9, 627, 838, 869, 1250.

108. MERGEN, F. **Forest tree breeding research**. *Unasylva* 13 (2), 1959 (81–8). 4 refs.

Briefly reviews research on individual tree selection, progeny and clonal tests, and vegetative propagation.

109. GATHY, P. La génétique forestière dans quelques pays d'Europe occidentale. Compte rendu de mission. [**Forest tree breeding in some countries of Western Europe. Report on a mission.**] *Trav. Sta. Rech. Groenendaal* (*Sér. B*) No. 21, 1958. pp. 64 + 9 plates. 45 refs. [F.]

An account of genetical research and practical tree breeding in Great Britain, Norway, Sweden, Denmark and W. Germany.

110. BROWICZ, K., and BUGAŁA, W. Nowe odmiany drzew i krzewów otrzymane przez A. Wróblewskiego. [**New varieties of trees and shrubs obtained by A. Wróblewski.**] *Arboretum Kórnickie, Poznań* No. 3, 1957/1958 (71–96). 23 refs. [Pol.e. russ.]

Describes (with Latin descriptions of some) > 20 new varieties and forms obtained from 1926 to 1944 in breeding and selection work at Kórnik.

111. RAO, H. S. **Problems in Indian forest plant breeding**. *Indian For.* 85 (9), 1959 (515–27). 10 refs.

At the outset of a programme of genetics applied to forestry in India, it is useful to estimate what can or cannot be expected out of it. The material for such plant-breeding experiments exists in the forests, as well as in introduced exotics. Advantage should first be taken of self-pollinated species which already exist as 'pure lines', e.g. among the Papilionaceae. The evolution of sex in higher plants ranges from hermaphroditism to complete sex differentiation, and genetic programmes have to be appropriately adapted. The naturally cross-pollinating species, which may also have minute flowers in clusters, with a high degree of flower-drop, offer the greatest complexity to the breeder. Gene-frequencies occurring in nature could be assessed even from the beginning, while segregating populations will reveal further ratios. Cytologically, there is a paucity of polyploid series among the tropical forest species. Artificial methods of inducing polyploidy or mutations need to be exploited. Vegetative propagation of species suited to it, offers an immediate means of increasing selected individuals which can be used in plantations and then in seed orchards. Scions grafted on dwarfing stock should be valuable for seed orchards as well as to conduct selective pollinations. Portable tub-plants are suggested for easier location of plants for crossing. Suitable plant houses for climatic and physiological response-control need to be evolved for India. 'Isolation' planting could be utilized for self-pollination purposes in inbreeding. Juvenility at flowering of various species should be determined, in order to estimate the rate of reproductive cycles and intensity of breeding programmes. An inventory of mother trees for seed should be made all over the country for all species, and progenies raised from them and tested. Progenies of recorded 'giant trees' should be raised to evaluate the genotype of these moribund old individuals. Among the important forest plant-breeding problems of India are: Wattle (*Acacia* spp.) breeding, improvement of *Tectona grandis*, *Pinus roxburghii*, *Santalum album*, *Prosopis* spp., *Casuarina* spp., *Hardwickia binata*, *Bombax malabaricum*, *Terminalia* spp., aromatic grasses, medicinal plants and others yielding minor forest products. *From author's summary.*

112. ROHMEDER, M. Forstgenetik und Forstpflanzenzüchtung in der Bibliographie des Oxford-systems. [**Forest genetics and forest tree breeding in the Oxford Decimal Classification System.**] *Silvae Genet.* 8 (4), 1959 (109–11). 2 refs. [G.g.e.f.]

Suggests a rearrangement of the sections dealing with these subjects, grouping, under head 165,

sections at present appearing under 165, 181.5, 232.1 and 232.3.

113. BOLLAND, G., and HOFFMANN, K. Die Verwendung von Randlochkarten in der Forstpflanzenzüchtung unter besonderer Berücksichtigung der Aufnahme von Auslesebäumen. **[The use of punched cards in tree breeding with particular reference to inventories of élite trees.]** *Silvae Genet.* 8 (3), 1959 (69–84). 58 refs. [G.g.e.f.]

Gives examples of the use of this method in provenance trials and breeding for disease resistance, reviews methods of keeping records used in different countries, and describes and illustrates the use of punched cards in making inventories of élite trees.

114. YEATMAN, C. W. **A tree crown isolation tent.** *Proc. 6th Mtg. Comm. For. Tree Breeding Can., Montreal 1958, Part 2*, 1958 (*R*19–*R*20).

Describes a tent made of pillow-ticking, 6 ft. in diam., 6 ft. deep, and enclosed by a skirt that was drawn in about the tree trunk and central tent pole. The shape of the tent was maintained by a 2-ft. disk of plywood at the top, and 2 willow hoops, 6 ft. in diam., one at mid-point and one at the bottom of the side of the tent. Guy ropes extending from the lower hoop to the ground, kept the tent in position. The tent was successfully applied to the crown of an 85-ft. White Spruce. Subsequently 8 more tents were made, in different sizes, of fine white sailcloth, and successfully used for self- and cross-pollination and control isolation in mature White Spruce.

115. NILSSON, B. Om lärkfrö och lärkhybrider för Mellansverige. **[Larch seed and Larch hybrids for Central Sweden.]** *Svenska SkogsvFören. Tidskr.* 57 (2), 1959 (309–24). 29 refs. [Sw.sw.]

Reports on crossing experiments with 6 *Larix decidua*, 3 *L. leptolepis* and 2 *L. eurolepis* clones plus 1 clone each of *L. sibirica*, *L. gmelinii* var. *principis-rupprechtii* and 1 *L. gmelinii* var. *japonica* as ♀, and 1 clone each of *L. decidua*, *L. leptolepis* and *L. sibirica* as ♂ parents, also selfing experiments at Brunsberg, resulting in ca. 12,000 seedlings aged 2 years, in 41 combinations. Numbers of seeds per cone varied considerably between, but little within, each clone, the % of viable seed generally being greatest where total numbers were greatest. Of 9 clones self-pollinated, 8 were completely or nearly self-sterile, and 1 (*L. decidua*) self-fertile. The effect of seed weight on first-year growth varied considerably, but strong positive correlation was found only in 3 clones. A strong cumulative effect of the parents' growth properties could be noted, especially in hybrids, which generally grew better than pure progeny of the same parent. Most selfed plants suffered from inbreeding depression. Hybrids with *L. sibirica* were most frost-hardy, and all hybrids, particularly *L. decidua* hybrids, hardier than the pure species. Significant differences in dry-matter content of shoot ends were found between progeny of different ♀ (but not between those of different ♂) parent species. No correlation was found between dry-matter content and frost hardiness; a correlation existed, though not very strong, between dry-matter content and growth, the faster growing clones having a lower dry-matter content. *L. sibirica* hybrids, and particularly hybrids of *L. gmelinii* var. *principis-rupprechtii*, are thought to be promising for Central Sweden.

116. GATHY, P. À propos du mélèze d'Europe en Belgique. Détermination de l'origine des peuplements par l'analyse morphologique des cônes. **[*Larix decidua* in Belgium. Determination of provenance of stands by morphological analysis of the cones.]** *Bull. Soc. For. Belg.* 66 (8/9), 1959 (397–413). 37 refs. [F.f.]

Although a review of the available literature indicates that most Belgian stands of European Larch are of lowland (Polish, Sudeten, Tatra) origin, analysis of cones shows that the best stands are in fact of alpine provenance.

117. LANGNER, W. Selbstfertilität und Inzucht bei *Picea omorika* (Pančič) Purkyne. **[Self-fertility and inbreeding in *P. omorika*.]** *Silvae Genet.* 8 (3), 1959 (84–93). 17 refs. [G.g.e.f.]

Presents the results of experiments in selfing and intraspecific crossing made at Schmalenbeck. The restricted range and unusual uniformity of growth habit suggest that this species holds an exceptional position within the genus *Picea*. Differences in times of flushing and flowering in 50-year-old trees indicated, however, that the limited genetic variation shown by the growth habit does not extend to all characteristics. *P. omorika* proved to be parthenocarpic. Apomictic seed development seems to be possible, for 11 seeds were found in 12 unpollinated cones; these seeds did not germinate. It is as fertile in selfing as in cross-pollination, and this self-fertility is a special characteristic of the species. Differences in 1000-seed weight are so small that, here again, a limited genetic variation must be assumed. The relatively high viability of seeds obtained after selfing equals that of seed obtained from crossing. Measurements of 1- and 2-year seedlings, however, show a clear inbreeding depression, varying from one individual to another. The progenies of selfed trees were also distinguished by their yellowish needle colour. This appears to result from chlorophyll deficiencies due to homozygosity of special genes. The breeding possibilities offered by the special characteristics of *P. omorika* are discussed. *From author's summary.*

118. MCWILLIAM, J. R. **Interspecific incompatibility in *Pinus*.** *Amer. J. Bot.* 46 (6), 1959 (425–33). 47 refs. O.B.D.

The problem of interspecific incompatibility in several intra- and intersectional crosses in the genus *Pinus* was investigated, using both an anatomical and a biochemical approach. To provide a background for this work, the development of ovules after intraspecific pollination and of unpollinated ovules was studied. The development of the gametophytes and fertilization after intraspecific pollination in Austrian Pine were regular and showed no major deviation from previous descriptions. Unpollinated ovules of Austrian Pine broke down approximately 1 month after the strobilus became receptive. The breakdown appears to result from the lack of some growth factor in the ovule, which in pollinated ovules is probably initiated by the growth of the

pollen tube in the nucellus. Parthenocarpy was not observed, nor could it be induced in unpollinated ovules, and it is considered to be a rare phenomenon in the species. The causes of incompatibility in the crosses studied (Slash Pine × Austrian Pine; Red Pine × Pitch Pine; Austrian Pine × Pitch Pine; Red Pine × Austrian Pine; Austrian Pine × Red Pine) appear to be related to the inability of the pollen tubes to function normally in the nucellar tissue of a foreign species. Factors that interfere with this normal development indirectly cause the breakdown of the developing gametophyte, and bring about the ultimate collapse of the ovule. In many respects this pattern of development resembles the situation in unpollinated ovules, and again the lack of a specific growth factor appears to be involved. The initial cause of incompatibility following the cross Austrian Pine × Red Pine may be related to a chemical difference between the ovules of these species. Differences found in the concentration of amino acids, particularly arginine, result in a different chemical environment within the ovule. This may interfere with the normal metabolism of the pollen, affecting either its capacity to germinate or its ability to supply the necessary continued stimulus for the development of the gametophyte. Differences in the pattern and timing of the incompatibility reaction following interspecific pollination may reflect the extent of the genetic diversity between the species. In many crosses between species, the incompatibility reaction does not seem to be complete, as evidenced by the vigorous initial pollen tube growth in occasional ovules. *Author's summary.*

119. MERGEN, F. **Applicability of the distribution of stomates to verify Pine hybrids.** *Silvae Genet.* 8 (4), 1959 (107–9). [E.e.g.f.]

Evidence obtained showed stomatal analysis to be a valid test for identifying putative hybrids and for verifying hybrids from controlled crosses. The method was successfully used in verifying hybrids of the crosses *Pinus thunbergii* × *P. densiflora*, *P. densiflora* × *P. nigra* and *P. monticola* × *P. strobus*. For seedlings resulting from open-pollinated seed collected from *P. nigra* the analysis indicated some pollination by another species, possibly *P. thunbergii*. In a cross *P. griffithii* × *P. strobus* where the ♀ strobili were not bagged, the progeny were not pure *P. griffithii* seedlings. The limitations of the method of stomatal analysis were however shown by an attempt to compare seedlings of the cross *P. ayacahuite* × *P. strobus*; the means and frequency distributions of the two species were not dissimilar enough to allow a comparison. *From author's summary.*

120. SCHÜTT, P., and HATTEMER, H. H. Die Eignung von Merkmalen des Nadelquerschnitts für die Kiefern-Bastarddiagnose. [**The suitability of cross-section characters of the needle for the diagnosis of Pine hybrids.**] *Silvae Genet.* 8 (3), 1959 (93–9). 9 refs. [G.g.e.f.]

An examination was made of needle cross-sections of *Pinus nigra* var. *austriaca*, *P. sylvestris* and their F_1 hybrids in order to estimate the diagnostic value of the following characters: (1) numbers and (2) position of the resin ducts, (3) form of the pericycle, (4) the formation of sclerenchyma layers between the steles and (5) the size of the hypoderm. The characters were found to vary with the individual, within the individual, with the season, and even within the same needle; (2) and (4) proved the most stable of the characters studied, but even these are unsuitable for the diagnosis of hybrids unless used in conjunction with numerous other anatomical and morphological characters. [Cf. *F.A.* 19 No. 2726.]

121. BANNISTER, M. H., BREWERTON, H. V., and MCDONALD, I. R. C. **Vapour-phase chromatography in a study of hybridism in *Pinus*.** *Svensk PappTidn.* 62 (16), 1959 (567–73). 11 refs. [E.e.sw.g.] P.R.

[Cf. *F.A.* 20 No. 4179.] Vapour-phase chromatography was used to analyse the composition of the steam-volatile fraction of the oleoresin of *P. radiata* and *P. attenuata*. Results confirm a marked difference in the α-pinene and β-pinene proportions in the two species. F_1 hybrids were, with one exception, intermediate, and a number of putative hybrids showed α-pinene/β-pinene ratios intermediate between those of *P. radiata* and the F_1. For the 47 samples studied, there was in general a close agreement between a ranking based on chemical analyses and an independent ranking based on morphological characters supplemented by some progeny tests. It was concluded that, in population studies, analyses of the volatile fractions of the oleoresins can well be included. Volatile fractions from spring shoots and winter buds differed considerably from those of oleoresins from the same trees and were too variable to be of value. *From authors' summary.*

122. HOFMAN, J., and HEGER, B. Vzrůstavost hladkokorých a hrubokorých typů douglasky. [**The growth rate of the smooth- and rough-barked types of *Pseudotsuga taxifolia*.**] *Preslia* 31 (3), 1959 (287–303). [Cz.russ.g.] E.M.B.

The growth rate of Douglas Fir was investigated in 14 stands aged 48–78 years. The trees were divided into 3 types: (*a*) with smooth bark, f. *glabrosa*; (*b*) with thin, furrowed bark and cracks 2–5 cm. wide, f. *rugosa*; (*c*) with thick, deeply furrowed bark with cracks > 5 cm. wide, f. *lacertosa*. On average, trees with (*a*) were the shortest and those with (*c*) the tallest. The differences in height between (*b*) and (*c*) were not statistically significant; the superiority in height growth of (*b*) and (*c*) over (*a*) did not depend on age. The superiority in diameter growth of (*b*) and (*c*) over (*a*) was even more pronounced, and likewise did not depend on age. The silvicultural defect of (*b*) and (*c*), i.e. their susceptibility to fungal attack, and the limitations of using the bark type as a criterion in selection, are discussed.

123. STERN, K. Über einige Experimente zur Artfrage bei Sand- und Moorbirke. [**The question of species in *Betula verrucosa* and *B. pubescens*.**] From *abstr.* in *Silvae Genet.* 8 (4), 1959 (125). [G.]

Discusses trials in crossing *B. verrucosa* with *B. pubescens*, reasons for the incompatibility of these species, and light thrown thereby on the origin of *B. pubescens*.

124. VÁCLAV, E. Generativní hybridizace břízy (*Betula* sp.). [**Sexual hybridization of Birches.**] *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 5 (8), 1959 (773–802). 36 refs. [Cz.cz.russ.g.e.]

A study was made in 1956 of the effects on seed quality of free-, self-, and cross-fertilization of Birches, using pollen from 7 *B. verrucosa* [cf. *F.A.* 20 No. 2817] and from individual *B. gmelini* specimens. Best results were obtained from cross- and free-fertilization, poor seed resulting from self-fertilization. Data are given indicating the growth rates of one-year-old hybrid seedlings, of which those resulting from crossing with a mixture of pollen proved the most satisfactory. Other factors studied for their influence on seed quality include the distance of the father tree from the fertilization centre, and the height above sea-level.

125. URQUIJO LANDALUZE, P. La protección del castañar. Las enfermedades y los insectos nocivos situatión y tendencias. Quince años de hibridaciones de castaños. [**The protection of Chestnut stands. Diseases and pests situation and trends. Fifteen years of hybridizing Chestnuts.**] [*Docum.*] *4e Sess. Comm. Int. Chât. 1958* No. *FAO/CH 25-Ca*, 1958. pp. 4. [Span.]

A summary of work at the Estación de Fitopatología Agrícola de la Coruña from 1943 onwards.

126. JOVANOVIĆ, B., and TUCOVIĆ, A. Hibridizacija topola u 1957 godini. [**Poplar hybridization in 1957 [at the Dendrological Institute, Forestry Faculty, Belgrade].**] *Topola, Beograd* No. 7, 1958 (559–94). 23 refs. [Serb.]

A longer article than that noticed in *F.A.* 20 No. 1470, with illustrations.

127. MEYER-UHLENRIED, K. H. Über die Vererbung der Holzfaserlängen bei verschiedenen Arten der Gattung *Populus*. [**Inheritance of wood-fibre lengths in various species of *Populus*.**] *Züchter* 29 (3), 1959 (117–23). 20 refs. [G.g.] E.M.B.

Measurements of fibre length were made on 10 species and hybrids from the sections *Aigeiros* and *Tacamahaca* and hybrids between the two. The findings of Liese and Ammer on *P.* × *robusta* [see *F.A.* 19 No. 4745; 20 No. 5099] were found to hold good for other species. Two distinct types of fibre (illustrated) were found, varying morphologically and, in the section *Tacamahaca*, in length. Fibre length on normal sites was constant for different trees within a species, irrespective of site, when samples measured were from a comparable location in the tree. Distinct differences in fibre length were found between the sections *Aigeiros* and *Tacamahaca*, but not between species within these sections.

128. SEITZ, F. W. Einige Erfahrungen bei der Anzucht von Aspensämlingen. [**Some experiences in raising Aspen from seed.**] From *abstr.* in *Silvae Genet.* 8 (4), 1959 (124–5). [G.]

Advocates a method of cutting back first-year seedlings, in order to spread over 2 years experiments in diallele crossing of Aspen, thereby obtaining a larger quantity of material for investigation.

129. ORTMANN, C. Zur Methodik der künstlichen Samenträgerkultur und Sämlingsanzucht bei *Salix*. [**Methods of growing Willow cuttings for seed production [in breeding experiments] and of raising seedlings.**] *Züchter* 29 (3), 1959 (132–7). 8 refs. [G.g.] E.M.B.

In greenhouse experiments at Bernburg in 1956–58, cuttings were rooted in sand-filled trenches of 25 or 30 × 40 cm., 30–40 cm. apart, in a bed of the local loess-loam humus soil [cf. *F.A.* 20 No. 4285]. Trenches were watered initially 2–3 times a day, and temperatures of 10–20° C. were maintained. Cuttings planted on 18 February 1957 were cross-pollinated on 5, 9 or 13 March; seed was sown on 26 or 28 March or 1 April; and seedlings were transplanted on 11–14 April. Cuttings rooted heavily and rapidly. In germination experiments in 1958, neither temperature variations in the range 10–20° nor high relative humidity had an adverse effect on germination. Germination % and seedling development on filter paper were improved by the addition of a nutrient solution. Conditions in which seedlings were grown in a breeding experiment begun in spring 1958 are described.

130. KHOSHOO, T. N. **Polyploidy in gymnosperms.** *Evolution* 13 (1), 1959 (24–39). 97 refs. O.R.S.

A review, covering the subjects of polyploid seedlings in the progeny of diploid species (recorded for e.g. *Pinus densiflora*, *P. radiata*, *Picea abies*), polyploid trees in diploid species (so far recorded once each for *Larix decidua* and *Juniperus virginiana*) and polyploid species. The various hypotheses to explain the rarity of polyploidy in gymnosperms are reviewed.

131. SAITO, Y., and HASHIZUME, H. [**Studies on a triploid tree of *Cryptomeria japonica* selected in the planted forest.**] *Bull. Tottori Univ. For.* No. 1, 1958 (21–55). 76 refs. [Jap.jap.e.e.]

A triploid tree from a 38-year plantation was examined, and its morphological, physiological and silvicultural characters were compared with those of diploids. Its chromosome number was found to be $2n = 33$. Needles were thicker and guard cells and pollen grains larger in the triploid than the diploid, and the number of stomata per unit area was smaller. There was no clear difference in size of cone or seeds, but the diameter/length ratio of cones was higher and cone weight lower in the triploid. Triploid and diploid plants showed little difference in their resistance to cold or to chlorate (soaking in various concentrations of $KClO_3$ solution for various periods), except that triploids raised from cuttings or grafts were slightly injured by early frost. Successful rooting of cuttings and union of grafts were lower in triploids but both were increased by the use of growth substances (5–500 p.p.m. K IAA solution and 50–100 p.p.m. Na NAA/lanolin paste, respectively). Flowering and cone production were good, with a good harvest every 3–4 years, but seed fertility was very low, and total numbers of seeds per cone and weight of seeds were less than those of the diploid. The triploid had smaller diameter, height and volume, greater taper and branch girth, smaller angle of branch to stem and a sparser and narrower crown than the diploid. *From authors' summary.*

132. MERGEN, F. **Natural polyploidy in Slash Pine.** *Proc. 6th Mtg. Comm. For. Tree Breeding Can., Montreal 1958, Part 2*, 1958 (*R*1–*R*6). 16 refs.

A search was made in Olustee forest nursery for abnormal seedlings of *Pinus elliottii*, which were found to occur at a rate of about 0·0002%. Some 50 of these were dug up and all had underdeveloped root systems; most of them proved to be mixoploid, made up of diploid, triploid and tetraploid cells. The survival rate of these mixoploid seedlings was low.

133. MACKEVIČ, N. V. Èksperimental'naja poliploidija u *Populus tremula* L. **[Experimental polyploidy in *P. tremula*.]** *Dokl. Akad. Nauk SSSR* 126 (1), 1959 (183–6). 6 refs. [Russ.] A.P.B.

A short account of experiments in the induction of polyploidy in *P. tremula*, and also in *P. balsamifera*, *Euonymus europaeus* and *Quercus robur*, with the aid of colchicine. [No conclusions or growth figures are given.] [Cf. *F.A.* 15 No. 101.]

134. RAGHAVAN, R. S. **Chromosome numbers in Indian medicinal plants—III.** *Proc. Indian Acad. Sci.* 49*B* (3), 1959 (239–44). 10 refs. O.R.S.

Species include *Sonneratia apetala*, *Cicca acida*, *Putranjiva roxburghii*, *Grewia tenax*, *Celastrus paniculata*, *Ardisia solanacea*, *Strychnos nux-vomica*, *Holarrhena antidysenterica*, and *Pandanus tectorius*.

168. Histology.

See also Nos. 912 *et seq.*

135. BARNES, R. L., and NAYLOR, A. W. **Culture of Pine root callus and the use of *Pinus clausa* callus in preliminary metabolic studies.** *Bot. Gaz.* 120 (2), 1958 (63–6). 16 refs. O.B.D.

Cultures of root callus from 5 species of Southern Pine were established and maintained by serial transfer. Sand Pine callus was used for preliminary studies on respiratory pathways of the tissue, together with experiments on the metabolism of amino acids and organic acids associated with respiration.

136. BARNES, R. L., and NAYLOR, A. W. ***In vitro* culture of Pine roots and the use of *Pinus serotina* roots in metabolic studies.** *For. Sci.* 5 (2), 1959 (158–68). 21 refs.

[Cf. *F.A.* 20 No. 1477.] Isolated roots of *P. serotina*, *P. clausa*, *P. palustris*, *P. elliottii* and *P. taeda* were successfully grown in sterile culture and maintained in subculture for > 2 years. Results were that: light inhibited root growth of all 5 species; 8% sucrose was the best C source tested; Slankis' medium [see *F.A.* 12 No. 109] was satisfactory, and better than the other medium used, because of the absence of glycine; investigation of reversible inhibitions of growth by oxythiamine and desoxypyridoxine helped to elucidate some of the functions of thiamine and pyridoxine in *P. serotina* roots; kinetin, auxins, vitamins, amino acids, etc. caused changes in the branching habit of roots; respiratory inhibitors, antimetabolites, and radioactive metabolites, in conjunction with paper chromatography, outlined some of the major metabolic pathways in the roots; the isolated roots proved excellent material for studies of amino-acid metabolism. *From authors' summary.*

137. SUSSEX, I. M., and CLUTTER, M. E. **Seasonal growth periodicity of tissue explants from woody perennial plants *in vitro*.** *Science* 129 (3352), 1959 (836–7). 5 refs. O.R.S.

Species included in the experiments were *Ginkgo biloba*, *Salix babylonica*, *Populus nigra* var. *italica*, *Syringa vulgaris*, *Acer rubrum*, *Ailanthus altissima*, *Fraxinus americana*, *Catalpa bignonioides*, *Robinia pseudoacacia*, *Quercus alba* and *Q. borealis* var. *maxima*, using secondary phloem explants removed to standard aseptic culture at 6-week intervals. Explants of all species proliferated in culture. Those of Lilac proliferated throughout the year and most extensively of all the species studied; proliferation was most extensive in explants taken in the spring, decreasing in those taken through the growing season but increasing again several months before bud break. Explants of *Acer rubrum* and the *Quercus* spp. proliferated during shorter periods (with *A. rubrum* only those removed in February to August proliferated). The other species followed a pattern similar to that of Lilac. No relationship was found between the increasing growth in winter and the breaking of dormancy in the terminal buds.

17. Systematic Botany

See also No. 93.

172.8. Eumycetes (True Fungi)

See also Nos. 29, 622 *et seq.*, 1102 *et seq.*

138. SINGER, R. **Monographs of South American Basidiomycetes, especially those of the east slope of the Andes and Brazil. 1. The genus *Pluteus* in South America.** *Lloydia* 21 (4), 1958 (195–302). 9 refs. P.R.

Includes descriptions of some 45 new species and varieties, many occurring on trees and on dead or rotting wood.

174. Spermatophyta, Seed-Plants in General. Floras and Check-Lists.

See also Nos. 65, 106–7.

139. ZOHARI, M. **List of trees and shrubs native to Israel.** Society of Israeli Foresters, Ilanoth. 1959. pp. 8. [E.Heb.]

Includes trees and shrubs attaining, under natural conditions, a height of at least 1 m.

140. HAYASHI, Y. **Notes on Japanese trees and shrubs (3).** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 107, 1958 (27–32 + 11 photos). [E.Jap.]

Nos. 22–30 [cf. *F.A.* 16 No. 3821] cover varieties and forms of *Fagus japonica*, *Quercus mongolica*, and *Hydrangea*, *Skimmia*, *Zanthoxylum*, *Helwingia* and *Lonicera* spp., plus two herbaceous plants.

141. BALAPURE, K. M. **Flora of New Forest, Dehra Dun, with special reference to indigenous species.** *Indian For.* 85 (6), 1959 (339–51). 14 refs.

Lists 275 species, giving their flowering period. Attention is drawn to the large number of exotic plants that are becoming acclimatized on the estate.

142. WORTHINGTON, T. B. **Ceylon trees.** Colombo Apothecaries' Co., Ltd., Colombo. 1959. pp. [11] + 429 + [11]. 65 refs. Price *Rs.*40.

Species are arranged by families and genera. The data on the 429 species include distribution of the tree, habitat in Ceylon, brief notes on the tree, bark, leaf, flower, fruit and wood, and the most popular vernacular names. A photograph of leaves, and usually flowers or fruit, is given for each.

143. JACQUES-FÉLIX, H. État actuel de nos connaissances sur la flore et la végétation du Cameroun. [**Present state of our knowledge of the flora and vegetation of the French Cameroons.**] *Mem. Soc. Broteriana* 13, 1958 (25–30). 52 refs. [F.]

A review with bibliography presented at the 3rd general assembly of A.E.T.F.A.T., Paris, 1957.

144. FERNANDES, A. Progrès dans l'étude de la flore de l'Angola. [**Progress in the study of the flora of Angola.**] *Mem. Soc. Broteriana* 13, 1958 (33–45). 43 refs. [F.]

A review with bibliography presented at the 3rd general assembly of A.E.T.F.A.T., Paris, 1957.

145. WILD, H. **New and little known species from the Flora Zambesiaca area. IV.** *Bol. Soc. Broteriana* (*Ser. 2*) 32, 1958 (37–60). [E.]

Includes descriptions of new species of *Boscia*, *Maerua*, *Triumfetta*, *Dovyalis* and *Homalium*.

146. CUFODONTIS, G. **New and little known species from the Flora Zambesiaca area. V. A new *Pittosporum* [*P. kapiriense*] from N. Rhodesia.** *Bol. Soc. Broteriana* (*Ser. 2*) 32, 1958 (61–2). [E.]

147. ROBSON, R. **New and little known species from the Flora Zambesiaca area. VI.** *Bol. Soc. Broteriana* (*Ser. 2*) 32, 1958 (151–73). 6 refs. [E.]

Deals with the Annonaceae, Violaceae and Guttiferae,and includes descriptions of the new tree species *Hexalobus mossambicensis* and *Garcinia pachyclada*.

148. CAVACO, A. Aperçu de l'état actuel de nos connaissances sur la flore du Moçambique. [**The present state of our knowledge of the flora of Mozambique.**] *Mem. Soc. Broteriana* 13, 1958 (69–77). 12 refs. [F.]

A review with bibliography presented at the 3rd general assembly of A.E.T.F.A.T., Paris, 1957.

149. MERXMÜLLER, H. Prodromus der Flora von Südwestafrika. [**Prodromus of the flora of South-West Africa.**] *Mem. Soc. Broteriana* 13, 1958 (93–5). 36 refs. [F.]

A review with bibliography, presented at the 3rd general assembly of A.E.T.F.A.T., Paris, 1957.

150. CUNNINGHAM, G. C. **Forest flora of Canada.** *Bull. For. Br. Can.* No. 121, 1958. pp. x + 144. 12 refs. [E.F.] Price $1.50.

Photographs of ca. 350 plants from the ground flora, with index of scientific, French and English names.

151. **Native trees of Canada.** *Bull. For. Br. Can.* No. 61 (5th ed.) 1956. pp. 293. Price $1.50.

The format of the previous edition [cf. *F.A.* 11 No. 1665] has been preserved and new material added, especially on distribution. A description of rooting habits has been incorporated wherever such information was available. [Cf. *F.A.* 21 No. 106.]

152. ZAVITZ, E. J. **Hardwood trees of Ontario, with bark characteristics.** Ontario Department of Lands and Forests, Toronto. 1959. pp. 60.

Illustrates and describes 64 species.

174.2/.7. Gymnosperms

See also Nos. 103, 119–22, 914, 931.

153. GAUSSEN, H. Un nouveau genre de conifères: *Cathaya*. [**A new coniferous genus: *Cathaya*.**] *Rev. for. franç.* 11 (7), 1959 (548–50). [F.]

An account drawn from that in *Bot. Ž.* 43 (4) 1958 [cf. *F.A.* 20 No. 175].

154. WOLAK, J. Nowa forma świerka pospolitego z Puszczy Białowieskiej. [**A new form of *Picea abies* from the Białowieża Forest.**] *Roczn. Dendrol. Polsk. Tow. Bot., Warsz.* 13, 1959 (205–7). 7 refs. [Pol.]

Discusses briefly 5 forms of *P. abies* described hitherto, and the new form *labiata*, several examples of which have been found in the forest.

155. MARTIN, E. J. Die Sequoien und ihre Anzucht. [**Sequoias and their cultivation.**] *Mitt. Dtsch. Dendrol. Ges.* No. 60, 1957/58 (1959), (3–62 + 12 plates). 387 refs. [G.]

Includes discussion on the following subjects:— the nomenclature of *Sequoia sempervirens* and *S. gigantea*; palaeobotany of the genus; discovery and identification of these species and of *Metasequoia glyptostroboides*, with botanical description of the latter; the American provenances of *S. gigantea*, its natural associates, and its performance (as single trees, in small groups, and in plantations) on several sites in W. Germany, with details of its environmental requirements; the wood of the three species, especially its physical properties and uses; and the collection, treatment, quality and germination of *S. gigantea* seeds, with notes on damping-off of young seedlings.

176.1. Dicotyledons

See also Nos. 98, 123, 444, 915–9, 1002.

156. CUATRECASAS, J. **Studies in South American plants. V.** *Brittonia, N.Y.* 11 (3), 1959 (163–72).

Includes descriptions of the following new tree species: *Maytenus subopposititifolius*, *M. duqueana*, *Amanoa macrocarpa*, *Cecropia catarinensis* and *Meliosma littlei*.

157. ENGLER, A., and PRANTL, K. Die natürlichen Pflanzenfamilien. Band 17 a II. Angiospermae: Reihe Magnoliales (2. Teil) redigiert von H. Melchior. R. Fries, Annonaceae. J. C. Th. Uphof, Eupomatiaceae, Myristicaceae. H. Melchior und W. Schultze-Motel, Canellaceae (Nachtrag zu Band 21). [**The natural families of plants. Vol. 17*a* II. Angiosperms: Magnoliales Part II. edited by H. Melchior. R. Fries, Annonaceae. J. C. Th. Uphof, Eupomatiaceae, Myristicaceae. H. Melchior and W. Schultze-Motel, Canellaceae (Supplement to**

Vol. 21).] Duncker & Humblot, Berlin. 2nd ed. (rev.) 1959. pp. 229. Many refs. [G.] Price £5. 12*s*. 6*d*.

158. FRIES, R. E. Die Annonaceen der sechsten Regnellschen Expedition. [**The Annonaceae of the sixth Regnell expedition.**] *Ark. Bot.* 4 (1), 1957 (23–7 + 3 plates). [G.] O.B.D.

Describes the following new tree species from Ecuador: *Malmea macrocarpa*, *Guatteria asplundiana*, *Raimondia stenocarpa*, *Annona ecuadorensis* and two new varieties of *Rollinia dolichopetala*.

159. JENTYS-SZAFEROWA, J. Problematyka brzozy czarnej (*Betula obscura* Kotula). [**Problems connected with *B. obscura*.**] *Roczn. Dendrol. Polsk. Tow. Bot., Warsz.* 13, 1959 (11–66). 18 refs. [Pol.e.*e*.]

[Cf. *F.A.* 13 No. 2803.] Presents all the tabulated data on the 16 leaf characters of *B. obscura*, derived from the 50 leaves taken from the whole range of the tree, and also from two local samples of 90–100 leaves. Only by investigating the local variation of *B. verrucosa* and *B. obscura* growing side by side, will it be possible to decide whether *B. obscura* is a separate species. A study of the leaves of *B. atrata* from Czechoslovakia proved that they are of the *verrucosa* type, and that in all probability *B. atrata* is the same as *B. obscura*.

160. JENTYS-SZAFEROWA, J. **The genus *Carpinus* in Europe in the paleobotanical literature.** *Repr.* from *Monographiae Botanicae* 7, 1958. pp. 59 + 2 plates. 67 refs. [E.e.pol.*pol*.]

The fossil involucres of the genus in Europe are divided into 4 morphological types, similar in shape to the four types occurring in present-day species, namely *C. betulus*, *C. orientalis*, *C. caroliniana*, and *C. tschonoskii*. *From author's summary*.

161. WILLIAMS, L. O., and CUATRECASAS, J. **A critical new *Bursera* [*B. standleyana*] from Costa Rica.** *Trop. Woods* No. 110, 1959 (30–2 + 1 plate).

162. LEENHOUTS, P. W. **Revision of the Burseraceae of the Malaysian area in a wider sense. X *a. Canarium*.** *Blumea* 9 (2), 1959 (275–475). 11 pp. of refs. [E.] O.R.S.

In two parts: (1) general (morphology, geography, comparative taxonomy); (2) special, with descriptions of and keys to 75 species, including *C. parvum* sp. nov. [Cf. *F.A.* 18 No. 3748.]

163. DING HOU. **A conspectus of the genus *Bhesa* (Celastraceae).** *Blumea*: *Suppl.* No. 4, 1958 (149–53). [E.] O.R.S.

B. paniculata and the new combinations *B. ceylanica*, *B. indica*, *B. robusta* and *B. archboldiana*. Includes a key to species.

164. LUNDELL, C. L. **A new species of *Wimmeria* [*W. sternii*] (Celastraceae) from Panama.** *Trop. Woods* No. 110, 1959 (29 + 1 photo).

165. GRIFFITHS, M. E. **A revision of the African species of *Terminalia*.** *J. Linn. Soc.* (*Bot.*) 55 (364), 1959 (818–907). 38 refs.

With key to, descriptions of, and notes on, the 28 species accepted. Brief mention is made of 7 named species treated as imperfectly known and 5 unnamed taxa which may be new species. Short notes on 4 introduced species are also included.

166. KOSTER, J. T. **Notes on Malay Compositae IV. Vernonieae—Vernoninae.** *Blumea*: *Suppl.* No. 4, 1958 (170–7). [E.] O.R.S.

Revised keys to the sections and species, and descriptions of species including a small tree, *Vernonia subdentata* sp. nov.

167. HOOGLAND, R. D. **Additional notes on Dilleniaceae 1–9.** *Blumea* 9 (2), 1959 (577–89). [E.] O.R.S.

[Cf. *F.A.* 14 No. 3104.] Distinguishes between *Dillenia pteropoda* and *D. papyracea*, includes supplementary information on *D. ovalifolia*, *D. montana* and *D. quercifolia*, and descriptions of the new species *D. nalagi*, *D. insularum* and *D. cyclopensis*, and discusses the validity of nomenclature of *Tetracera sarmentosa* and its subspecies.

168. HUGUET DEL VILLAR, E. Estudio sobre los *Quercus* del Oeste mediterráneo. [**Study of *Quercus* spp. in the western Mediterranean.**] *An. Inst. Bot. A. J. Cavanilles* 15, 1957 (3–114). [Span.] O.B.D.

Notes on the systematy and nomenclature of: (1) *Quercus robur* and *Q. estremadurensis*, (2) *Q. petraea* and *Q. mas*, (3) *Q. pyrenaica*, (4) *Q. lanuginosa* (= *pubescens*) and *Q. palensis*, (5) *Q. cerroides*, (6) *Q. lusitanica* and *Q. faginea*, and (7) *Q. subpyrenaica*.

169. DONČEV, Ž. B. Beležki vărhu formite na njakoi dăbove ot ceroidnata grupa v Albanija. [**The forms of some Oaks of the subgenus *Cerris* in Albania.**] *Nauč. Trud. Lesoteh. Inst., Sofia* No. 6, 1958 (111–31). 18 refs. [Bulg.f.]

Discusses the Albanian Oaks of the sections *Vallonea* and *Castaneifolia*, with drawings and Latin descriptions of two new varieties, *Quercus aegilops* vars. *ballotin* and *malero*, and of two new species, *Q. illyrica* and *Q. sphaerocarpa*, comparing these with *Q. macedonica*.

170. MARTINEZ, M. Los encinos de México. XI. [**The Oaks of Mexico. XI.**] *An. Inst. Biol. Univ. Méx.* 29 (1/2), 1958 (89–105). [Span.] C.G.B. [Cf. *F.A.* 20 No. 1494.]

171. PAŞCOVICI, V. O nouă formă de stejar de interes economic şi ornamental în flora R.P.R.: *Quercus robur* L. var. *tardiflora* forma *cochlearifolia*. [**A new form of Oak of economic and ornamental interest in the flora of Rumania: *Q. robur* var. *tardiflora* forma *cochlearifolia*.**] *Rev. Pădurilor* 74 (2), 1959 (76–8). 4 refs. [Rum.russ.g.f.e.]

With Latin diagnosis. The new form was found in the Paşcani forest.

172. LÉANDRI, J. Le problème du *Casearia bridelioides* Mildbr. ex Hutch. et Dalz. [**The problem of *C. bridelioides*.**] *Bull. Soc. Bot. France* 105 (9/10), 1958 (512–7). [F.] O.B.D.

A new monotypic genus *Keayodendron* is proposed, based on *K.* (*Casearia*) *bridelioides*.

173. MANNING, W. E. ***Alfaroa* and *Engelhardtia* in the New World.** *Bull. Torrey Bot. Cl.* 86 (3), 1959 (190–8). 2 refs. O.B.D.

Discusses the taxonomy of these genera and presents a preliminary key based as far as possible on fruiting specimens.

174. HOYLE, A. C. **Note on typification of *Librevillea klainei* (Pierre ex Harms) Hoyle.** *Bol. Soc. Broteriana* (*Ser. 2*) 32, 1958 (149–50). [E.]

[Cf. *F.A.* 17 No. 3676.] Presents a full citation of the holotype specimen.

175. FERNANDES, A., and DINIZ, M. A. Contribuição para o conhecimento das Lythraceae de Angola. **[The Lythraceae of Angola.]** *Publ. div. Inst. Bot. Univ. Coimbra* No. 10, 1958. pp. 30 + 8 plates. [Port.f.e.] (*Repr.* from *Garcia de Orta, Lisboa* 6 (1), 1958 (87–130).

176. BORSSUM WAALKES, J. VAN. **Notes on Malaysian Malvaceae II. A new *Thespesia* species from New Guinea.** *Blumea*: *Suppl.* No. 4, 1958 (154–7). [E.] O.R.S.

Describes *T. patellifera* sp. nov. and distinguishes it from *T. populnea.*

177. CAVACO, A. Une espèce nouvelle de *Decarydendron* (Monimiaceae). **[*D. lamii* sp. nov.]** *Blumea*: *Suppl.* No. 4, 1958 (28–31). [F.] O.R.S.

178. TOYAMA, S., ANDO, M., and KUROSE, H. **Studies on the Paper Mulberry—IV. Classification of Paper Mulberry (*Broussonetia* spp.) races by means of spodograms of the leaves.** *Repr.* from *Memoirs, Faculty of Liberal Arts and Education, Miyazaki University* No. 1, 1957 (81–95 + 8 plates). 20 refs. [E.e.]

Sixteen varieties (cultivars) of *B. kazinoki* and *B. papyrifera* were classified by spodograms into 5 groups, with those close to the species as the extremes and 3 intermediate groups.

179. WIT, H. C. D. DE. **Revision of *Afrardisia* Mez. (Myrsinaceae).** *Blumea*: *Suppl.* No. 4, 1958 (242–62). [E.] O.R.S.

A key to and description of 16 species, mostly shrubs or small trees, including *A. comosa* sp. nov.

180. AMSHOFF, G. J. H. **Notes on Myrtaceae VIII. Two new species from Africa.** *Acta bot. neerland.* 8 (1), 1959 (54). [E.] O.B.D.

Describes *Syzygium germainii*, a small tree, and *S. parvulum*, a shrub.

181. SZYMANOWSKI, T. Nowa odmiana jesionu wyniosłego (*Fraxinus excelsior* L. var. *voyslavicensis* Szym.). **[A new variety of Ash: *F.e.* var. *voyslavicensis*.]** *Roczn. Dendrol. Polsk. Tow. Bot., Warsz.* 13, 1959 (165–70). 7 refs. [Pol.]

Discusses several varieties of *F. excelsior*, describes the new variety, and compares it with *F.e.* vars. *diversifolia* and *pendula.*

182. FERNANDES, A., and FERNANDES, R. Contribuição para o conhecimento das Passifloraceae de Angola. **[The Passifloraceae of Angola.]** *Publ. div. Inst. Bot. Univ. Coimbra* No. 13, 1958. pp. 23 + 16 plates. [Port.f.e.]

183. FERNANDES, A., and FERNANDES, R. Contribuição para o conhecimento das Passifloraceae de Moçambique. **[The Passifloraceae of Mozambique.]** *Publ. div. Inst. Bot. Univ. Coimbra* No. 11, 1958. pp. 22 + 15 plates. [Port.f.e.]

184. KUNKEL, G. *Plantago fernandezia* Bert. Ein baumförmiger Wegerich auf den Juan Fernandez-Inseln. **[*P. fernandezia*: an arborescent Plantain on the Juan Fernandez islands [Chile].]** *Mitt. Dtsch. Dendrol. Ges.* No. 60, 1957/58 (1959), (80–1 + 1 plate). 8 refs. [G.]

A brief description.

185. JONKER, F. P. **The genus *Rhizophora* in Suriname.** *Acta bot. neerland.* 8 (1), 1959 (58–60). 7 refs. [E.] O.B.D.

Observations on the occurrence of *R. harrisonii*, *R. mangle* and *R. racemosa* in Suriname, with short notes on their habitat.

186. BREMEKAMP, C. E. B. **New *Ixora* species from Bengal, Burma and the Nicobar Islands.** *Indian For.* 85 (7), 1959 (371–5).

Describes 5 new species, including one tree, *I. tenuifolia.*

187. BRIZICKY, G. K. **Notes from the S. J. Record Memorial Collection. III.** *Trop. Woods* No. 110, 1959 (38–41 + 1 photo).

Includes a section on the validation of *Meliosma longipetiolata.*

188. VOLKMANN, J. H., and MEYER-UHLENRIED, [K.-H.] Bibliographie des internationalen Pappelschrifttums. Band II, 1954. **[Bibliography of international literature on Poplars. Vol. II, 1954.]** Nationale Pappelkommission, Verwertungsausschuss, Braunschweig/Freiburg i. Br. 1955. pp. 146. [G.]

[Cf. *F.A.* 17 No. 176.] Contains 620 titles and a synopsis of Kollmann's classification of wood utilization and the Oxford System of Decimal Classification for Forestry.

189. MEYER-UHLENRIED, K.-H. Bibliographie des internationalen Pappelschrifttums. Band III, 1955/58. **[Bibliography of international literature on Poplars. Vol. III, 1955–1958.]** Forstbotanisches Institut der Universität Freiburg, Freiburg/Brsg. 1959. pp. vii + 206. [G.]

Contains 1619 titles.

190. PAPP, J. A *Salix* nemzetség szakirodalma. **[Literature on the genus *Salix*.]** *Erdész. Kutatás., Budapest* 1958 (3/4), (245–52). 256 refs. [Hu.]

Most of the references are Hungarian (with some German and other sources), and cover the period 1830–1940.

191. KAO, Y.-C. **[Notes on Chinese Samydaceae.]** *Acta bot. sinica* 8 (1), 1959 (25–50 + 4 plates). [Chin.e.*e.*]

Reviews the Chinese Samydaceae, and proposes one new species of *Casearia* and six new species of *Homalium*, with Latin descriptions of each. The species are shrubs, or trees up to 12 m. in height. A key to the two genera is given in the English summary.

192. ROYEN, P. VAN. **Revision of the Sapotaceae of the Malaysian area in a wider sense. XVII. *Aulandra* H. J. Lam.** *Blumea: Suppl.* No. 4, 1958 (263–7). [E.] O.R.S.

A key to and descriptions of the species *A. beccarii* nov. comb., *A. cauliflora* and *A. longifolia.*

193. KOSTERMANS, A. J. G. H. **A monograph of the genus *Heritiera* Dry. (Sterculiaceae) (including *Argyrodendron* F. v. M. and *Tarrietia* Bl.).** *Publication, Council for Sciences of Indonesia, Djakarta* No. 1, 1959. pp. 121. [E.e.]

Unites the genera *Argyrodendron* and *Tarrietia* with *Heritiera.* Describes 31 species, including 10 new species and 10 new combinations.

194. HAMAYA, T. **Dendrological studies of the Japanese and some foreign genera of the Thymelaeaceae. Anatomical and phylogenetic studies.** *Bull. Tokyo Univ. For.* No. 55, 1959 (1–80 + 6 maps, 11 plates). 53 refs. [E.jap.]

Covers wood and bark anatomy, morphological characters of taxonomic importance and their phylogenetic significance, and a synopsis of Japanese Thymelaeaceae, covering the genera *Wikstroemia, Edgeworthia, Diplomorpha, Daphnimorpha* and *Daphne.*

18. Plant Ecology

See also No. 321.

181. Mode of Life, Autecology. Silvicultura Characters of Trees

See also Nos. 131, 155, 288, 317, 356.

195. SUSMEL, L. Ecologia, biologia e possibilità attuali di coltivazione dell' abete bianco (*Abies alba* Mill.) nell' Appennino centro meridionale. **[Ecology, biology, and conditions for growing *A. alba* in the south-central Apennines.]** *Ital. for. mont.* 14 (3), 1959 (89–111 + 17 photos). 56 refs. [It.f.]

Distinguishes the Italian ecotypes of *A. alba* and the vegetation of their respective natural habitats, and discusses the possibility of re-introducing the south-central Apennine ecotype from the warm sub-zone of the *Castanetum* to the warm sub-zone of the *Fagetum* in Turkey Oak/Chestnut/Beech woods that are not excessively degraded.

196. FOILES, M. W. **Silvics of Grand Fir [*Abies grandis*].** *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 19, 1959. pp. 12 + 1 sketchmap. 21 refs.

197. LITTLE, S. **Silvical characteristics of Atlantic White-Cedar (*Chamaecyparis thyoides*).** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 118, 1959. pp. 16. 15 refs.

198. BOYD, R. J., JR. **Silvics of Western Redcedar [*Thuja plicata*].** *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 20, 1959. pp. 14 + 1 sketchmap. 40 refs.

199. TACKLE, D. **Silvics of Lodgepole Pine [*Pinus contorta* var. *latifolia*].** *Misc. Publ. Intermt. For. Range Exp. Sta.* No. 19, 1959. pp. 24 + 1 sketchmap. 68 refs.

200. LITTLE, S. **Silvical characteristics of Pitch Pine (*Pinus rigida*).** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 119, 1959. pp. 22. 48 refs.

201. TUTAJUK, V. H. O nekotoryh pokazateljah ėkologičeskoj prisposoblennosti dikorastuščej el'darskoj sosny (*Pinus eldarica* Medw.). **[Some indications of the adaptation of wild *P. eldarica* to its environment.]** *Bot. Ž.* 44 (2), 1959 (185–93). 35 refs. [Russ.]

Describes the only natural stand of *P. eldarica* in the world, on the Eller-Oukhi range, 80 km. N. of Kirovabad in Azerbaijan, at 200–600 m. alt. It covers 544 ha. (110 ha. pure), with *Juniperus* spp. as frequent associates. Observations are made on the variation of height increment with site, the plentiful fruiting, strong development of the corky layers of the bark (which can reach thicknesses of > 20 cm.), and the typically xerophytic needle structure of the trees in their natural habitat. Some of these characteristics are less pronounced in plantation-grown trees.

202. STEFANESCU, P. Contribuţii la cunoaşterea existenţei naturale a pinului silvestru varietatea *erecta* în Cheile Bicazului. **[The natural occurrence of *Pinus sylvestris* var. *erecta* in the Bicaz defile.]** *Rev. Pădurilor* 74 (6), 1959 (335–7). 5 refs. [Rum. russ.g.f.e.]

The variety described has some very desirable characters—rapid growth, wood of good technological properties, stems of excellent form. It is suited to growing on very shallow soils.

203. HADFIELD, M. **The Durmast Oak [*Quercus sessiliflora*] in Britain.** *Quart. J. For.* 53 (3), 1959 (197–205). 28 refs.

Describes diagnostic, ecological, silvicultural and economic differences between *Q. sessiliflora* and *Q. robur*, and the history of the recognition of the former as a distinct species. It is considered that *Q. robur*, owing to its greater reproductive powers on all but infertile sites, and the activities of man, has occupied many areas in Britain more suited to, and once occupied by, *Q. sessiliflora.*

181.1. Distribution, Natural Range

204. COOK, D. B., and SMITH, R. H. **A White Spruce outlier at Shushan, New York.** *Ecology* 40 (3), 1959 (333–7). 8 refs.

Describes a stand of *Picea glauca* on the southern limit of its range and discusses the factors influencing the southern boundary of this species.

205. HOLOVSKÝ, M., and HOLUBIČKOVA, B. K otázce původnosti boru na Plzeňsku. **[Origins of the Pine forests of the Plzeň region.]** *Věd. Práce Výzkum. Ust. Lesa Mysl., Praha* No. 1, 1957 (71–89). 22 refs. [Cz.russ.g.]

An historical and phytocoenological analysis of the distribution and ecology of *Erica carnea* indicates that W. Czechoslovakian Pine stands are largely indigenous, despite the introduction at the end of the 19th century of a certain amount of foreign seed. The original ecotype persists in 100-year stands which it is recommended to keep intact as seed sources. The admixed hardwoods should be left

as they are and felled only when the main stand is finally felled since the original ecotype is one of the most suitable Pines in W. Czechoslovakia.

206. SANTOS, B. DOS. A carta da distribuição do sobreiro em Portugal. Qual a área efectiva e actual dos nossos montados de sobro? **[Distribution map of Cork Oak in Portugal. What is the effective present area of our Cork forests?]** *Bol. Junta Nac. Cortiça, Lisboa* No. 248, 1959 (213–6). [Port.]

Presents figures based on the published distribution maps for annual cork production in various districts of Portugal and the area covered by Cork Oak classed in 4 grades by density of stocking. The average production of cork is estimated at 193 kg./ha. annually, though with marked variations from district to district.

207. BULLOCK, D. S., and STERN, W. L. **Notes on the distribution of *Gomortega*.** *Trop. Woods* No. 110, 1959 (33–7). 8 refs.

G. nitida, the sole member of the Gomortegaceae, is endemic in Chile.

181.2. Atmospheric Relations. Acclimatization

See also Nos. 79, 83, 97, 261, 266–8, 270, 297–8, 343, 352 *et seq.*, 394, 936.

208. VAARTAJA, O. **Evidence of photoperiodic ecotypes in trees.** *Ecol. Monogr.* 29 (2), 1959 (91–111). 73 refs.

The hypothesis of photoperiodic ecotypes was tested with 38 tree species of 19 genera and 81 seed sources from various latitudes in the northern hemisphere. The 4 greenhouse test conditions differed photoperiodically but received the same amount of light from sun and fluorescent tubes. In general, the farther north the seed source, the greater was the response to test conditions, and the longer was the maximum ('critical') day-length that strongly inhibited the seedlings. The interaction of seed source and photoperiod was analysed in comparisons of latitudinally distant seed-source pairs within 17 species belonging to 9 genera. In most cases interactions were recorded in the following responses: (1) *Duration of elongation.* Under certain day-lengths elongation of northern seedlings soon ceased, while it continued in southern seedlings. No difference, or less, was found under other day-lengths. The endogenous seasonal elongation pattern was entirely overruled by the effects of photoperiods in many species (e.g. 5 *Picea* spp.) or only modified in others (e.g. 5 *Pinus* spp.). (2) *Amount of growth.* Height and top weight of northern as compared with southern seedlings were very small under certain day-lengths but not under others. The growth responses followed a certain pattern in accordance with the hypothesis. (3) *Lateral development.* Number of side branches and buds was restricted in northern seedlings under short days. All these facts are in accordance with the hypothesis. Individual variation was usually greatest at the critical day-length, as would be expected if the populations were somewhat mixed in their inherited responses to photoperiods. It is suggested that the photoperiodic ecotypes have evolved as an indirect mechanism in the adaptation of trees to various seasonally changing climatic factors. Therefore, they are only approximately similar at different sites in each latitude. *From author's summary.*

209. HELLMERS, H. **Photoperiodic control of bud development in Coulter Pine and Bigcone Douglas-Fir.** *For. Sci.* 5 (2), 1959 (138–41). 12 refs.

Two-year-old seedlings of *Pinus coulteri* and *Pseudotsuga macrocarpa* were placed under two photoperiods : (*a*) 9 hr., and (*b*) 20 hr., from October to July, in a greenhouse where minimum temperatures were $\lessdot 64°$ F. All plants of both species broke dormancy under (*b*) within 6–8 weeks, whereas under (*a*) no plants did so within this period. This photoperiodic control over bud dormancy prevents premature formation of new shoots during mild winters or unseasonable warm spells. *From author's summary.*

210. MOLSKI, B., and ŻELAWSKI, W. Przyczynek do poznania procesu różnicowania się stożka wzrostu w związku z reakcją fotoperiodyczną pędu wegetatywnego modrzewia (*Larix europaea* DC). **[Notes on differentiation in the shoot apex in relation to the photoperiodic reaction in vegetative shoots of *L. decidua*.]** *Roczn. Dendrol. Polsk. Tow. Bot., Warsz.* 13, 1959 (119–24 + 4 plates). 3 refs. [Pol.]

Results have mostly been reported earlier [see *F.A.* 16 No. 1501; 19 No. 168].

211. BAŁUT, S. Wpływ długości oświetlenia dziennego i temperatury na przebieg rocznego cyklu życiowego siewek *Fagus silvatica* L. i *Abies alba* Mill. **[The influence of day-length and temperature on the one-year life cycle of *F. sylvatica* and *A. alba*.]** *Ekologia Polska, Warszawa* 4*A* (8), 1956. pp. 292. 65 refs. [Pol.russ.g.*russ.g.*] L.S.

In an attempt to distinguish between the different development phases of the young plant and its response to external conditions, Beech and Fir seedlings were subjected to (*a*) a 10-hour day-length, and (*b*) continuous lighting at a steady temperature of $> 15°$ C. Fir seedlings were also subjected to (*c*) periodic changes of day-length and a steady temperature of $> 15°$, and (*d*) continuous lighting and periodic temperature changes. The light source was a 500-watt bulb held 60 cm. above the plants. The effect on growth rhythm, growth rate and Lammas-shoot formation is discussed and a comparison made with seedlings grown under normal conditions.

212. WARDLE, P. **The regeneration of *Fraxinus excelsior* in woods with a field layer of *Mercurialis perennis*.** *J. Ecol.* 47 (2), 1959 (483–97). 5 refs.

An investigation on the relation of 2-layer communities based on observation and field experiments (chiefly in the Cambridge area) with special reference to light conditions. Experiments on a cleared *M. perennis* site indicated that net assimilation rate became nil at a daylight factor of $< 9\%$ (probably ca. 7%). Under dense *M. perennis*, recently germinated seedlings soon disappear, but where it is less dense, e.g. where it gets shaded out itself by the trees or, more effectively, by the shrub layer, slow-growing Ash seedlings persist for many years,

presumably because, opening their buds before the canopy, they assimilate sufficiently before the light intensity falls too low. These suppressed seedlings grow rapidly where gaps occur in the canopy. Observations support the theory that growth rate is highest under medium shade because of the greater relative leaf area in such conditions. Ash, then, becomes dominant where dryness, or instability of the soil etc. are unfavourable to the *M. perennis* layer. Much of the seed investigated was damaged by *Argyrotoza conwayana*, much was eaten by small rodents (as shown by a control experiment with plots protected against rodents, and/or birds, squirrels, and insects) or otherwise destroyed in the long dormancy period, but seedlings were nevertheless generally quite plentiful at the beginning.

213. KAMINSKY-KRÖGER, C., WILHELMI, T., and BERGEMANN, J. Einige Untersuchungen über das Wachstum junger Waldbäume bei Auspflanzung im Wärmeklima fremder Waldformationsklassen. **[Some investigations on the growth of young forest trees transferred to the temperature climate of foreign forest formation-classes.]** *Forstwiss. Cbl.* 78 (5/6), 1959 (180–7). 5 refs. [G.g.]

Young *Pinus sylvestris*, *Pseudotsuga taxifolia*, *Larix leptolepis* and *Quercus borealis* were planted (*a*) in the open at Reinbek, and (*b*) in a subtropical glasshouse (Lisbon-type climate). *L. leptolepis* and *Q. borealis* were also planted in (*c*) a tropical glasshouse (Singapore-type climate). Observations were made for 3–4 years on the rhythm of growth, habit, and shoot lengths of these plants, and of some other subtropical and tropical trees also planted in (*b*) and/or (*c*). In (*b*), the Sachsenwald (Germany) provenance of *P. sylvestris* did outstandingly well, exceeding in growth plants of the same provenance in (*a*). *P. taxifolia* did fairly well in (*b*) but some trees developed an unusual habit (e.g. no side branching), which will require further investigation. *L. leptolepis* soon failed entirely in (*c*) and died in its third year in (*b*). *Q. borealis* grew quite well in the first two years, especially in (*b*), but then height increment fell off sharply, and the trees failed. All these four temperate species retained their characteristic dormant period in (*b*). *Eucalyptus rostrata* did not grow at its normal rate in (*c*), but did well in (*b*). On the basis of these results, it is thought likely that *P. sylvestris* would give a satisfactory performance on suitable sites in subtropical regions, though the possibility of pests and diseases occurring at older stages cannot be excluded.

214. HSÜ, W.-Y., *et al.* **[Study of the vernalization of trees.]** *For. Sci., Peking* No. 4, 1959 (310–20). 4 refs.

Reports glasshouse investigations which showed that *Pinus tabulaeformis* and, to a lesser extent, *P. densiflora* required low winter temperatures. If kept warmer, they did not develop properly. *Populus* spp., *Salix* spp. and *Ulmus pumila* also needed certain low temperatures, which varied with species; *Amorpha fruticosa* and *Lespedeza bicolor* did not. Phenological data are given.

215. TUMANOV, I. I., KRASAVCEV, O. A., and HVALIN, N. N. Povyšenie morozostojkosti berezy i černoj smorodiny do −253° putem zakalivanija. **[Increasing the frost resistance of *Betula verrucosa* and *Ribes nigrum* to −253° C. by 'hardening'.]** *Dokl. Akad. Nauk SSSR* 127 (6), 1959 (1301–3). 4 refs. [Russ.] A.P.B.

Continued experiments [cf. *F.A.* 17 No. 1325] were made on (1) 3-year-old shoots of *B. verrucosa* cut on 9th April in Moscow, and (2) 1-year-old shoots of two varieties of *R. nigrum* cut on 11th March in and near Moscow. The shoots of (1) and (2) were gradually cooled ('hardened') at different rates for the two species (the Birch in 11 days), to −60° C., then placed in liquid N for 2 days, and then in liquid H for 2 hours. After this, they were returned to the liquid N, allowed to warm very gradually, and transferred to a greenhouse. Examination 12 days later showed that all the buds of (1) had flushed, the ♂ and ♀ inflorescences were still alive, and the pollen was viable. Birch shoots which were not hardened were killed at −40°. Similar results were obtained with (2). Arguments are given for supposing that plants could be cooled to absolute zero without harm. The slow cooling to −60° results in only hygroscopic water being left in the cells, thus avoiding the fatal formation of ice within the cells.

216. AVDOŠIN, E. M. Morozostojkost' kornevoj sistemy nekotoryh drevesnyh porod. **[The frost resistance of the root system of some woody species.]** *Fiziol. Rast.* 6 (1), 1959 (92–4). 4 refs. [Russ.] A.P.B.

As winter ball-planting of larger (5- to 8-year-old) street and park trees in Moscow helps to spread employment round the year and can reduce costs, investigations were made from Dec. to March under field and laboratory conditions on the frost resistance of roots of 11 species commonly used. Wide variation in resistance was found to exist: *Robinia pseudoacacia* withstood −5° C., *Picea abies* −28°. Fatal temperatures were in all cases ca. 2–5° lower. Frost resistance decreased during spring and summer, when the roots were killed at −2·5 to −3·5°. The frost resistance of the roots depended to a large degree on the condition of the assimilating organs of the tree during the previous growing season: early removal of the crown reduced the frost resistance of the roots, whereas removal of the crown after leaf-fall did not. Of the trees examined, only *P. abies*, *Larix sibirica*, *Betula verrucosa* and *Pyrus baccata* could be safely transplanted during severe frosts. *Populus balsamifera*, *Tilia cordata* and *Acer platanoides* could be transplanted at air temperatures above −15°, or at lower temperatures when the ball of earth was suitably protected. *T. platyphyllos*, *Aesculus hippocastanum* and *R. pseudoacacia* should not be transplanted during the winter.

217. WATANABE, A. **[On the cold resistance of *Cinnamomum camphora* Sieb. and *C. camphora* var. *nominale* Hay. from Formosa.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (63–9). 10 refs. [Jap.e.e.]

A study of seedlings of *C. camphora* (*a*) from Formosa, (*b*) from Japan and var. *nominale* (*c*) also from Formosa confirmed that frost resistance of (*a*) and (*b*) was similar, but that of (*c*) considerably less.

Osmotic value and soluble-sugar concentration of cell sap were also much lower in (*c*).

218. NILSSON, A. Glanshäggen, *Prunus serotina* Ehrh. som förvildad vid Ringsjön, Skåne. [***P. serotina* growing wild at Ringsjö, Skåne.**] *Bot. Notiser* 112 (1), 1959 (111–3). [Sw.] O.B.D.

In an area of mixed woodland, dominated by Oak, 105 examples of *P. serotina* were found ranging from seedlings 0·1 m. high to fairly young trees, height 8 m., g.b.h. 35–40 cm. These had probably spread from the neighbouring estate of Ekehall, where there are several specimens of unknown provenance.

181.3. Water, Soil and Root Relations

See also No. 298.

219. FRITTS, H. C., and HOLOWAYCHUK, N. **Some soil factors affecting the distribution of Beech in a central Ohio forest.** *Ohio J. Sci.* 59 (3), 1959 (167–86). 13 refs. C.G.B.

In further studies [cf. *F.A.* 15 No. 1168; 18 No. 3199; 20 No. 3594] a comparison of the soil environment during 2 growing seasons was made on sites grading from a very poorly drained one, where Beech occurs only occasionally in a swamp forest association, to a moderately well drained site dominated by a Beech/Maple association. For the 3 soil types (silty clay or silt loams) covering this transition, the profile characteristics, chemical and physical properties, relative root density, and temperature and moisture regimes are described, and related particularly to the development of Beech in the 3 forest communities.

220. RASCHKE, G. Pappelanbau auf Grenzstandorten? [**Growing Poplars on marginal sites.**] *Holzzucht, Reinbek* 13 (3), 1959 (17–9). 9 refs. [G.]

Discusses German literature on experience with various species on sites with different unfavourable conditions, giving some data on the Reinbek trials with hybrid varieties. There, as elsewhere, the 'Oxford' Poplar had done very well on an originally rather heavy, acid poor soil, reaching 12 m. in height and 20 cm. d.b.h. at 7 years.

181.31. Water Relations

See also Nos. 273, 593, 637, 839.

221. FERRI, M. G., and COUTINHO, L. M. Contribuição ao conhecimento da ecologia do cerrado. Estudo comparativo da economia d'água de sua vegetação, em Emas (Est. de São Paulo), Campo Grande (Est. de Mato Grosso) e Goiânia (Est. de Goiás). [**The ecology of the *cerrados*. Comparative study of the water economy of the vegetation in Emas (São Paulo), Campo Grande (Mato Grosso) and Goiânia (Goiás).**] *Boletim, Faculdade de Filosofia, Ciências e Letras, Universidade de São Paulo, São Paulo* No. 224 (*Bot.* No. 15), 1958 (103–50). 17 refs. [Port.port.e.]

A study of transpiration was made on 6 important species in both Campo Grande and Goiânia and on 2 in Emas, and stomatal behaviour was investigated in 19 species in Campo Grande and 17 in Goiânia. Studies of stomatal behaviour made in Emas in 1944 were also taken into account. Rainfall, temperature and soil conditions were also investigated. Conditions and water economy were much the same in all 3 areas and there appeared to exist no necessity for restriction of water intake and transpiration. Stomata remained open all day in the majority of plants, stomatal movements were slow and foliar transpiration was in general high. It is concluded that water is not a limiting factor for vegetation in the *cerrados*. [Cf. *F.A.* 18 No. 267.]

222. ARENS, K. O cerrado como vegetação oligotrófica. [**The *cerrados* as oligotrophic vegetation.**] *Boletim, Faculdade de Filosofia, Ciências e Letras, Universidade de São Paulo, São Paulo* No. 224 (*Bot.* No. 15), 1958 (59–77). 40 refs. [Port.port.g.]

The vegetation of the Brazilian *cerrados* is predominantly xeromorphic, but this cannot be attributed to lack of water, since the woody species are very deep-rooted and do not need to limit their transpiration for lack of moisture. The xeromorphism is thought to be due to the oligotrophic nature of the soils, which are generally acid and poor in available bases, an important factor being the lack of available N. The vegetation can therefore be termed mesophytic or even hygrophytic, but composed of xerophytic elements. Fire accentuates the oligotrophic nature of the soils. The author concludes that large areas of the Brazilian *cerrados* represent an edaphic climax, but in the southern part of their range, they form a subclimax due evidently to the action of fire. Small changes in ecological conditions, e.g. greater accumulation of humus or addition of fertilizers, are enough to influence the balance in favour of an extension of the forests. [Cf. *F.A.* 18 No. 267.]

223. KURAMOTO, M., and NAGAOKE, T. [**Studies on the proper site for Todo-Fir in Hokkaido. X. Annual water movement in Todo-Fir forest soils.**] *Extr.* from *Ann. Rep. For. Exp. Sta., Hokkaido 1957*, 1959 (11–6). 6 refs. [Jap.e.*e.*]

[Cf. *F.A.* 20 No. 244.] Studies were made on good Todo Fir soils in May–October, 1956 and 1957. Results [given in graphs] show that moisture content of the surface layers is dependent on rainfall. Soils were classified edaphologically into several groups by annual water movement in the soil. *From authors' summary.*

224. SANDS, K., and RUTTER, A. J. **Studies in the growth of young plants of *Pinus sylvestris* L. II. The relation of growth to soil moisture tension.** *Ann. Bot., Lond.* (*n.s.*) 23 (90), 1959 (269–84). 20 refs. O.R.E.

[Cf. *F.A.* 19 No. 1353; 20 Nos. 240, 4057.] Young Pines in their first and third seasons of growth were grown in pots under moisture regimes in which the tensions were varied from 0·1 to ca. 9 atm. Compared with the 0·1-atm. treatment, 0·3 atm. significantly reduced the growth of first-year, and 0·5–1·5 atm. that of third-year, plants. The higher tensions used caused further reductions, and the plants seemed to be sensitive to tension differences throughout the growing season, the effects on growth being due mainly to variations in the net assimilation rate. *From authors' summary.*

225. SULLIVAN, C. Y., and LEVITT, J. **Drought tolerance and avoidance in two species of Oak.** *Physiol. Plant., Copenhagen* 12 (2), 1959 (299–305). 1 ref. [E.]

In an attempt to discover why *Q. palustris* is normally found on moist sites and *Q. rubra* on well drained uplands, 4- to 5-year potted seedlings were tested by watering (to field capacity) only when the leaves showed signs of permanent wilting, i.e. about every 9 days. In both species, sections cut from leaves of controls (kept well watered) died at relative air humidities of $< 96\%$, but leaf sections from the plants subjected to drought survived at 94%, and in some instances at 92% r.h. The only observed difference between species was that *Q. palustris* showed better growth when watered well.

226. WATANABE, S. **[Silvicultural studies on Kusu (*Cinnamomum camphora* Sieb.). V. Transpiration and survival of Kusu during some period after transplanting.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (19–25). 10 refs. [Jap.e.e.]

One-year seedlings were transplanted and their transpiration, water content of leaves and survival were studied. Transpiration decreased to ca. 15% of that of controls, but recovered after ca. 5 days if the plants had not wilted; in wilted plants it decreased still further. Watering increased transpiration a very little. Water content of leaves of transplanted seedlings did not decrease unless they wilted, but in wilted plants it decreased to 30% of that in controls.

227. WATANABE, S. **[Silvicultural studies on Kusu (*Cinnamomum camphora* Sieb.) VI. Relationship between removal of leaves and survival of seedlings of Kusu.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (27–30). 3 refs. [Jap.e.e.]

Experiments showed that $\geqslant 70\%$ of the leaves of seedlings should be removed before transplanting in order to ensure good survival.

228. WATANABE, S. **[Silvicultural studies on Kusu (*Cinnamomum camphora* Sieb.). VII. The influence of soil dryness on survival of transplanted seedlings of Kusu.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (31–6). 5 refs. [Jap.e.e.]

Stump plants made from 1-year seedlings were planted in pots and the soil allowed to dry to different degrees. At 80% of water capacity, survival and growth were good; at 60%, shoot growth, number of leaves and root development were reduced; at 40%, root development ceased and buds formed but did not shoot; below 40% neither root growth nor bud formation took place.

229. WATANABE, S. **[Silvicultural studies on Kusu (*Cinnamomum camphora* Sieb.). VIII. Regeneration of roots and shoots of transplanted seedlings of Kusu at various soil moisture.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (37–42). 3 refs. [Jap.e.e.]

In soil held at 80% of water capacity, growth of stump plants made from 1-year seedlings began and ended earliest, both processes being progressively delayed with increasing dryness until in soil at 40% only one plant sprouted 46 days after planting.

230. WATANABE, S. **[Silvicultural studies on Kusu (*Cinnamomum camphora* Sieb.). IX. The relationship between drying and survival on seedlings of Kusu.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (43–9). 7 refs. [Jap.e.e.]

When stump plants made from 1-year seedlings lost $> 10\%$ of moisture they suffered some damage; with 20% loss, die-back of tap-roots was considerable but survival after transplanting was moderately good; when water loss was $\geqslant 25\%$ most seedlings died after transplanting. When packed in moss and kept at 14–15° C. for ca. 1 week they gave good survival after planting.

231. WATANABE, S. **[Silvicultural studies on Kusu (*Cinnamomum camphora* Sieb.). X. Influence of soil drying on growth of seedlings of Kusu.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (51–61). 28 refs. [Jap.e.e.]

Height growth of 1-year seedlings ceased at a soil moisture content of ca. 21% (pF 3·7). Water content of leaves and stems decreased with decreasing soil moisture, slowly at first but more rapidly at soil moisture of $\leqslant 21\%$. Water content of roots decreased more slowly, but all these decreases in water content of plants occurred when soil moisture was well above permanent wilting point (m.c. 14·5%, pF 4·2).

181.32/.34. Soil and Nutrient Relations

See also Nos. 14–8, 32, 60–3, 244, 252, 343, 466 *et seq.*

232. OVINGTON, J. D. **The circulation of minerals in plantations of *Pinus sylvestris* L.** *Ann. Bot., Lond.* (*n.s.*) 23 (90), 1959 (229–39). 6 refs. O.R.E.

In continued work [cf. *F.A.* 20 No. 2922], analyses the dry weights and contents of Na, K, Ca, Mg, P and N, of the ground flora and of the organic layers formed above the mineral soil of Pine plantations aged 7, 11, 14, 17, 20, 23, 31, 35 and 55 years. From these data the distribution of mineral nutrients within the plantations is determined, and calculations are made of the annual circulation of nutrients through the ecosystem. A balance sheet is drawn up showing, for the different plantation ages, the weights (kg./ha.) of the different nutrients (*a*) taken up by the trees and ground flora, (*b*) returned to the mineral soil by litter decomposition, (*c*) left in the mineral soil in the roots of harvested trees, (*d*) removed from the ecosystem in harvested boles, and (*e*) the change in the remaining trees, ground flora and litter.

233. WEHRMANN, J. Die Mineralstoffernährung von Kiefernbeständen (*Pinus silvestris*) in Bayern. **[The mineral nutrition of *P. sylvestris* stands in Bavaria.]** *Forstwiss. Cbl.* 78 (5/6), 1959 (129–49). 39 refs. [G.g.]

Analyses were made of needles collected in autumn 1956, '57 and '58 from 6–10 trees in each of 68 stands of Pine, mostly 30–50 years old, and the total height, height increment and age of these trees were determined. A close and significant relation was found between N content of the needles and the site class (assessed by height) of the stand. N content ranged from 1·17 to 2·17%, the worst stands

having < 1·5% N in the needles. On raw-humus sites, Pine has sufficient N as long as the C/N ratio in the humus layer is < 28. If it is > 36, N deficiency is likely. There was also a close and significant relation between P content of the needles and site class. P contents ranged from 0·115 to 0·201%. The samples were not extensive enough to allow accurate assessment of the K, Ca and Mg status. There did not appear to be any grounds for suspecting K or Ca deficiencies, but Mg contents of the needles were low on many sites.

234. KUROYANAGI, S., and ISHIKAWA, T. **[Studies on mineral translocation and deposition in forest trees by spectrochemical analysis. II. On the deposition of mineral elements in roots and leaves of Sugi (*Cryptomeria japonica* D. Don) cultured in several conditions.]** *Scientific Reports of the Faculty of Agriculture, Okayama University, Okayama* No. 13, 1959 (47–55). 11 refs. [Jap.jap.e.*e.*]

Plants used in the experiments were grown (1) in nursery soil, (2) by hydroponics, and (3) in water from the Okayama municipal supply. The amounts of 5 elements found in leaves and roots were in the order: Ca > Mg > P > Mn > B. Amounts varied with the conditions of growth; amounts of all elements in leaves, and of B, Mg, Mn and P in roots, were found in the order, (1) > (2) > (3), and amounts of Ca in roots in the order, (1) < (2) < (3). Amounts in plants grown in (1) were higher in leaves than in roots, whereas with (3) there was little difference between leaves and roots. [Photographs are given showing the seedlings grown in the different media and growth of their foliage in 180 days, and tables showing height, diam. and weight etc. after 180 days.] *From authors' summary.*

235. WINTERHALDER, K. **Some aspects of plant-soil relationships in four native tree species.** *Abstr.* in *Aust. J. Sci.* 21 (9), 1959 (301). O.R.S.

A sand-culture experiment indicated that *Eucalyptus saligna, E. pilularis* and *E. gummifera* seedlings could exist on low K and Ca concentrations without significant reduction in growth, though *E. saligna* developed characteristic symptoms under low Ca conditions. Soil-culture experiments, with 3 soils of widely differing nutrient status, again indicated the low K and Ca requirements of *E. saligna* and *E. gummifera.* Mean values of ash, K, Ca and P contents of field leaf samples showed interesting differences between the species. Analytical data on leaves from pot trials indicate the range of mineral content under different nutrient conditions. Total P data on soils from various New South Wales localities have been correlated with the probable relative P requirements of the species. 'Chlorosis of *E. gummifera* seedlings grown in a rain-forest soil led to the study of possible causes, e.g., high pH, Fe or S deficiency, waterlogging. S deficiency symptoms have been induced in sand culture for *E. pilularis, E. gummifera* and *Ceratopetalum apetalum.* The influence of monovalent-cation/divalent-cation balance on the growth of *E. saligna* in sand culture has been studied. Differences in the ease of establishment of *C. apetalum* seedlings in different soils suggest great sensitivity of seedlings of this species to soil conditions.

236. JOSH, S. R. **Foliar calcium in *Anogeissus latifolia* Wall.** *J. Indian Bot. Soc.* 38 (1), 1959 (93–102). 13 refs. O.B.D.

Soils bearing *A. latifolia* have an exchangeable Ca content varying from 0·06 to 0·46% and pH values ranging from 5·78 to 7·25. Foliar Ca varies from 1·15 to 5·328%, and foliar ash from 2·214 to 22·78%. The amount of foliar Ca increases with increase in soil exchangeable Ca up to 0·17%, and then decreases. Soil Ca is probably a governing factor in the growth of *A. latifolia. From author's summary.*

237. BERGMAN, H. F. **Oxygen deficiency as a cause of disease in plants.** *Bot. Rev.* 25 (3), 1959 (418–85). 235 refs.

A review article, including many references to tree species, dealing with diseases caused by reduction in O supply to roots, deficient air supply to roots in relation to pathogenic organisms, and diseases caused by lack of O to parts other than roots.

238. HAYWARD, H. E., and BERNSTEIN, L. **Plant-growth relationships on salt-affected soils.** *Bot. Rev.* 24 (8/10), 1958 (584–635). 221 refs.

A review of literature appearing since the earlier report [cf. *F.A.* 7 No. 64], with particular emphasis on material relating to Japan and Russia. It contains a section on shade and roadside trees.

239. GRUZDEV, D. M. Vlijanie zasolennosti počv na rost duba i drugih porod v uslovijah orošenija v Azerbajdžanskoj SSR. **[Influence of soil salinity on the growth of Oak and other species in the irrigated regions of Azerbaijan.]** *Počvoved.* 1959 (3), (91–8). 25 refs. [Russ.russ.e.] A.P.B.

Trials were made in the period 1951–56 on plots in shelterbelts and nurseries in the irrigated zone, to determine the influence of various degrees of soil salinity on the survival, height and diameter increment, number of leaves, crown dimensions, dry weight, root system, and ash content of several tree and shrub species. At a salinity of 0·6–1·5% in the top metre of soil, only *Tamarix* sp. and *Elaeagnus angustifolia* grew successfully; at 0·2–0·6%, *Pinus eldarica, Ulmus pumila* var. *arborea, Platanus* [*orientalis*], *Morus alba, Robinia pseudoacacia, Gleditsia caspica, G. triacanthos, Sophora japonica,* etc. grew satisfactorily; and at 0·15–0·2%, *Populus* spp., *Fraxinus pennsylvanica, Catalpa* sp., *Quercus* spp., *Juglans regia,* etc.

240. CROCKER, R. L. **The plant factor in soil formation.** *Aust. J. Sci.* 21 (6*a*), 1959 (*P*180–*P*193). 86 refs. O.R.S.

Discusses and summarizes literature, much of it on tree species, giving synthesized tabulated data on e.g. accessions of plant litter to soil surfaces, nutrient elements returned to the soil in litter fall, N and organic C in mineral soil of the forest floor, pH of litter and soil under various species, and root diameters of forest and other species.

241. BEAUCORPS, G. DE. Rapports entre les peuplements d'*Eucalyptus* et les sols sableux de la Mamora et du Rharb. **[Relations between the Eucalypt plantations and the sandy soils of the Mamora and the Rharb.]** *Ann. Rech. for. Maroc*

1957, 1959 (26–216 + 12 photos, 2 maps, 4 dgms.). 48 refs. [F.f.e.span.]

A detailed report on studies already reported in part [cf. *F.A.* 18 No. 2719]. Part 1 describes the origin and characteristics of the soils, their fertility and response to fertilizing. Part 2 deals with the evaluation of the soils under Eucalypt plantations (the oldest of which date back to 1922). Annexes give experimental data from several sample plots; the results of studies on variation in soil pH, and seasonal change in soil content of exchangeable K and of humic and fulvic acids; and data derived from studies of the organic matter under Eucalypts (chemistry, biological activity etc.). In general it is concluded that the conditions most favourable to plantations in this region occur when the soil profile consists of a sand horizon 40–50 in. thick overlying a slightly permeable clay horizon, and the topography is flat. Where the second horizon is too shallow, losses due to evaporation and run-off may be serious, and trees sometimes stagnate after rapid initial growth. Where the sand is too deep, early growth is impeded, but in this case applications of P and K could help the trees to reach the deep layers better supplied with water. Investigations have shown that the poor humus replenishment in these Eucalypt plantations is due to an unfavourable N cycle, and a possible remedy is light cultivation in order to incorporate litter in the humus layer.

242. MIKOLA, P. Leppä metsämaan hoidossa. **[The Alder and forest soil.]** *Metsät. Aikak.* 1959 (6/7), (231–2). [Fi.e.]

Results of pot experiments on Pine seedlings fertilized with different kinds of litter (*Deschampsia flexuosa*, *Pinus sylvestris*, *Acer platanoides*, *Populus tremula*. *Sorbus aucuparia*, *Tilia cordata*, *Betula pubescens*, *Alnus glutinosa* and *A. incana*) showed that seedling weight increased with increasing N content of the litter and was highest for Alder litter. The practical significance of the results is discussed.

181.35. Special Modes of Nutrition. Symbiotic Relationships. Parasitism

See also Nos. 408–10, 618.

243. POMMER, E.-H. Über die Isolierung des Endophyten aus den Wurzelknöllchen *Alnus glutinosa* Gaertn. und über erfolgreiche Re-Infektionsversuche. **[The isolation of the endophyte from root nodules of *A. glutinosa* and successful experiments in re-inoculation.]** *Ber. Dtsch. Bot. Ges.* 72 (3), 1959 (138–50). 14 refs. [G.g.] O.B.D.

The organism causing root-nodule formation in *A. glutinosa* was isolated and cultured, and its development observed on an artificial nutrient medium. A method is described of cultivating seedlings of *A. glutinosa* on a silica gel (an ion-exchange agent) as a medium. Re-inoculation experiments with the isolated endophyte on aseptically cultivated *A. glutinosa* seedlings showed a positive result in 4–6 weeks, with the formation of nodules on the roots. It is not identical with *Actinomyces alni* Peklo, but the author believes it to belong to, or be very near to, the Actinomycetaceae.

244. MACCONNELL, J. T. **The oxygen factor in the development and function of the root nodules of Alder.** *Ann. Bot., Lond.* (*n.s.*) 23 (90), 1959 (261–8 + 1 plate). 7 refs. O.R.E.

[Cf. *F.A.* 17 No. 223.] O/N gas mixtures were bubbled through vessels in which the roots of Alders were growing in water culture. When the roots were inoculated with the nodule organism, the number of nodules was found to fall with decreasing O content of the mixture. In a further experiment on the growth of nodulated and non-nodulated (supplied with combined N) plants, the former were by far the more sensitive to O reduction. It is concluded that the O supply is of special importance in the development and function of the Alder nodule. The possible reasons for this are discussed. *From author's summary.*

245. BOULLARD, B. Étude des mycorrhizes dans le genre *Cedrus*. Première contribution. **[Mycorrhizae in the genus *Cedrus*. First contribution.]** *Bulletin de la Société Mycologique de France, Paris* 73, 1957 (225–44). 16 refs. [F.f.] O.B.D.

From a study made of roots of different ages and provenances of *Cedrus atlantica*, *C. atlantica* var. *glauca*, *C. brevifolia*, *C. deodara* and *C. libani*, it was concluded that they are all capable of association with ectotrophic mycorrhizae. Though rarely found on one-year-old plants, mycorrhizae develop quickly in the course of the second and third years of growth. They become scarcer as the trees grow older, and are seldom found on very old trees. They show great morphological variation. In spite of fluctuations in the intensity of mycorrhizal infection, the % of short roots remains fairly constant during the tree's first years. However, certain silvicultural practices such as root pruning or transplanting will favour the formation of short roots, and the tree's chances of survival. These short roots always develop near the soil surface. An examination of the distribution of fungi on or in them as a function of the distance from the root-tip, showed a gradient of resistance to mycorrhizal infection which deserves further investigation. Additional studies are also being carried out on roots growing in the immediate proximity of the saprophytic fungus, *Sepultaria sumneriana*.

246. MELIN, E. **Studies on the physiology of tree mycorrhizal basidiomycetes. I. Growth response to nucleic acid constituents.** *Svensk bot. Tidskr.* 53 (2), 1959 (134–54). 19 refs. [E.e.] O.B.D.

A number of tree mycorrhizal hymenomycetes were studied in their response to adenine and related substances. *Boletus variegatus*, in part, gave a marked positive response to adenine or hypoxanthine in a nutrient solution, whereas other species tested were unaffected or only slightly stimulated. In the case of *B. variegatus*, strength of response to adenine varied greatly from one strain to another and also within the same strain during the course of time. In the presence of excised tomato roots, strain D of *B. variegatus* responded positively to adenine at very low concentrations, whereas growth was increasingly inhibited with concentrations from ca. 10 μ mols per litre upwards. Adenine derivatives produced similar dose-response curves in the presence of tomato roots. Strong growth-inhibiting effects were caused by

adenine also in the presence of excised Pine roots or root-free exudates and extracts of roots. *From author's summary.*

247. HARLEY, J. L., MCCREADY, C. C., and BRIERLEY, J. K. **The uptake of phosphate by excised mycorrhizal roots of the Beech. VIII. Translocation of phosphorus in mycorrhizal roots.** *New Phytol.* 57 (3), 1958 (353–62). 13 refs. O.R.S.

[Cf. *F.A.* 17 No. 1334.] The temperature coefficients of phosphate absorption by Beech mycorrhizae for temperature intervals [ranges] below 20° C. were found to be above 2, regardless of the external concentration applied. Similar Q10 values were obtained for their constituent fungal and host tissues when exposed separately to phosphate solutions. The proportion of absorbed phosphate passing to the host through the fungal sheath was unaffected by temperature in very high or very low phosphate concentrations,and the Q10 values for absorption by both tissues were of the expected magnitude. By contrast, the proportion of phosphate passing to the host from intermediate concentrations (3·2 m*M*) was increased by low temperatures so that the estimates of Q10 for the host were lower than expected. Similarly, the inhibitors NaN_3 and iodoacetic acid diminished uptake by both fungus and host in high and low concentrations of phosphate, but did not affect the amount absorbed into the host from 3·2 m*M* phosphate. In a discussion, these results are considered together with previous experiments and it is concluded that in ecologically probable conditions phosphate passes to the host through the living hyphae of the sheath. *From authors' summary.*

248. STEVENSON, G. **Nitrogen fixation by non-legumes.** *Span, Shell Public Health and Agricultural News, London* 2 (2), 1959 (68–70).

[Cf. *F.A.* 20 No. 2926.] Discusses the question of N fixation by plants, and instances of gains in the N balance that appear inexplicable unless the possibility of plants fixing free atmospheric N is admitted. To test this theory, plants which have been observed to grow well in New Zealand on soils very poor in N were grown in pots in a strictly non-N culture. The plants included grasses, shrubs, *Nothofagus fusca* and *Pinus radiata*, the experiments being started with seedlings that had already developed their natural mycorrhizae, or in the case of the grasses, with unsterilized seed. The only plant to do well for a long period (3 years) was *P. radiata*, but all did well for at least 6 months. In all cases a substantial gain in N occurred and it was presumed some N fixation process had taken place. Further tests were made in which plants grown in strictly non-N culture in enclosed glass pots were given an atmosphere containing labelled N gas. After a period of growth the plants were reaped, the combined N extracted from them, and this analysed by spectrometer. Results proved that most of the plants (including both the trees) had utilized gaseous N. The problems still unsolved, such as the mechanisms involved, and the probable scope and applications of future research are briefly discussed.

181.36. Root Relations and Root Development etc.

See also Nos. 30, 216, 257, 449–50, 593.

249. WOOD, A. S. **Survival of European Larch root.** *Quart. J. For.* 53 (3), 1959 (273–4).

Cites an example of a root ca. 5 in. in diameter still in sound condition after remaining in the ground for 42 years after the tree was grub-felled.

250. MIRONOV, V. V. Pridatočnye korni derev'ev. **[Adventitious tree roots.]** *Priroda, Moskva* 48 (5), 1959 (118). [Russ.] A.P.B.

In order to examine the development of the adventitious root systems of several woody species in newly formed sandy layers, diggings were made in 1956 in young shelterbelts in the Stavropol region, after heavy winter rain and sand drifting. Adventitious roots of *Fraxinus pubescens* were revealed to a depth of 40–50 cm. in the 1·5 m.-thick surface horizon of typically semi-desert, sandy soil (mechanical composition given), the majority (0·5 m. long, 4–5 mm. thick) occurring down to a depth of 25 cm., and horizontally dispersed at lower depths. Very fine rootlets (< 1 mm. thick) from the main stem (3–3·5 cm. thick), located at 25–30 cm. depth, are evidently the result of heavy rains earlier in the year. Roughly similar developments were observed for *Gleditsia* [*triacanthos*?], *Robinia pseudo-acacia*, and *Morus alba*, but *Prunus* [*armeniaca*?] and *P.* [*cerasus*?] formed no adventitious roots under similar conditions.

251. HEIKURAINEN, L. Sekametsiköiden juuristoista ojitetulla suolla. **[The root structure in mixed forests on drained bogs.]** *Repr.* from *Acta for. fenn.* 67 (2), 1958. pp. 32. 19 refs. [Fi.G.]

Analyses root conditions on 5 plots on wet Pine peat moors with sedge vegetation [*sararäme*], drained 19 years earlier and stocked with Birch, Spruce and Pine in varying proportions of species, density, stand volume, increment etc. The total amount of roots (expressed in m. or g./sq. m.) was considerably greater than in the pure Pine stands previously analysed [cf. *F.A.* 17 No. 2555–6], which were growing on poorer types of peat moor, but here, as there, roots were fairly near the surface. Mean depth of rooting zone (based on roots < 1 mm. diam.) varied between 3·7 and 4·9 cm. The roots of Birch went deeper than those of the conifers and their total length and weight of roots < 1 mm. in diam. in relation to standing volume and basal area, were ca. twice that of Pine, with intermediate values for Spruce. Mycorrhizae were most plentiful and dense on Birch, where they increased in density with depth, while those on Pine (contrary to observations in Pine stands) remained about the same at any depth, and those on Spruce declined. The influence of Birch on conifers is discussed with reference to the possibility of soil oxygenation at greater depths being brought about by their root systems [cf. *F.A.* 17 No. 1330] on the one hand, and to root competition on the other.

252. VERETENNIKOV, A. V. Otmiranie i regeneracija kornevoj sistemy *Pinus sylvestris* L. v zavisimosti ot uslovij snabženija korneobitaemogo

sloja počvy kislorodom vozduha. [**The dying and regeneration of the root system of *P. sylvestris*, as related to oxygen supply in the rooting zone.**] *Bot. Ž.* 44 (2), 1959 (202–9). 13 refs. [Russ.russ.]

Plots were laid out in a 50- to 55-year stand in the *Pinetum myrtillosum*, the control (*a*) lying 20–40 cm. higher than (*b*) and carrying taller and better trees. Observations of the groundwater for 3 years showed that (*b*) was more often flooded than (*a*) and that its water table was always higher. Samples of groundwater taken from (*b*) at intervals from the surface to a depth of 40 cm. showed O deficiency in spring and autumn. Anaerobic conditions in the soil at these seasons killed many of the roots in (*b*), the weight of roots $\leq$ 2 mm. in diameter being less than half that on (*a*). Concentrations of roots were found where any slight elevations occurred on (*b*). New adventitious roots grew from the cambium of the living parts of damaged roots during the summer, and reached lengths up to 60 cm. in one season. The anatomy and morphology of these roots are described and illustrated; they have more protoxylem bundles than ordinary lateral roots, and show an increased number of parenchyma cells in the central zone, with individual elements or groups of metaxylem.

253. VOMPERSKIJ, S. Ė. Osobennosti stroenija kornevyh sistem *Pinus silvestris* L. na osušennyh torfjanyh počvah. [**Characteristics of the root system of *P. sylvestris* on drained peat soils.**] *Bot. Ž.* 44 (1), 1959 (79–87). 11 refs. [Russ.]

In investigations on the roots of 19-year Pines in plantations, and 22- and 40-year Pines in natural stands, all growing on peat soil with different degrees of drainage, 5 types of root system were distinguished: (*a*) with vertical taproot (t.r.) and horizontal roots spreading out from its lower end; (*b*) as (*a*) but with an inclined t.r.; (*c*) becoming horizontal at a depth of 10–20 cm.; (*d*) with t.r. dividing into several smaller roots which soon grow horizontally; (*e*) with no t.r. Rooting depths were 30–55 cm. for (*a*) and (*b*), 20–35 for (*c*) and (*d*), and 15–20 for (*e*). The frequency of occurrence of these types varied with soil drainage, (*a*) and (*b*) being more frequent on well, and (*e*) on poorly drained sites. In almost all of the excavated root systems, covering types (*a*) to (*e*), some horizontal surface roots were found to have a cross-section panduriform in outline, and $> 60\%$ of all horizontal surface roots showed this feature, which becomes more frequent and more pronounced as the trees get older (i.e. with increasing disproportion between the aerial parts and root system). It is thought that stresses in the roots caused by wind (i.e. tension in the upper, and compression in the lower half of the roots on the windward side, and vice versa in roots on the lee side of the tree) may be responsible for this shape, which has also been observed in Birch roots on similar sites.

254. GEORGESCU, C. C. Cîteva consideraţii asupra turtirii mecanice a rădăcinilor. [**The mechanical flattening of roots.**] *An. Inst. Cerc. Silv., Bucureşti (Ser. I)* 19, 1958 (25–30). 5 refs. [Rum. russ.f.]

A study was made of a ribbon-like Beech root that developed in a narrow fissure of a rock. The flattening occurred only in the compressed portion; when the root penetrated to soil, it resumed its normal cylindrical shape. In the flattened portion, the bark was replaced by callus-like periderm, the diameter of the vessels was reduced and they were elliptical in section, and the medullary rays were parallel to the plane surfaces.

255. MÉTRO, A., and SAUVAGE, C. Observations sur l'enracinement du chêne-liège en Mamora (Morocco occidental). [**The rooting of *Quercus suber* in Mamora (W. Morocco).**] *Ann. Rech. for. Maroc 1957*, 1959 (3–25 + 9 photos, 1 dgm.). 8 refs. [F.]

The root systems of 8 trees on different sites, but all on light sandy soils, were wholly or partially excavated, and the following conclusions drawn from the results. The main root system includes, in addition to the taproot (sometimes forked and sometimes not) a large number of lateral roots running more or less horizontally through the superficial sandy horizons before turning down to penetrate the underlying clay. The maximum length observed in such a root was 32 m., the downward bend occurring at 23 m. from the bole. Fine roots are abundant but not distributed continuously; they appear to result from the approach of ramifications of the lateral roots to the surface. Although mainly concentrated in the immediate neighbourhood of the stem, fine roots were found a good deal further from it than the limits of the tree crown. The maximum distance at which they were observed was 23 m., and they appeared to be more developed on the N. and E. sides of the tree than on the S. and W. The ecological results of this form of root system are discussed. Short notes are also given on root systems of some understorey species—*Cytisus linifolius*, *Cistus salviifolius*, *Chamaerops humilis* and *Thymelaea lythroides*.

256. BODE, H. R. Über den Zusammenhang zwischen Blattentfaltung und Neubilding der Saugwurzeln bei *Juglans*. [**The relationship between leaf development and the formation of new absorbing roots in *Juglans*.**] *Ber. Dtsch. Bot. Ges.* 72 (2), 1959 (93–8). 3 refs. [G.g.] O.B.D.

Observations on *J. regia* revealed that $> 90\%$ of the absorbing roots are shed during winter dormancy but that, despite this, normal spring flushing takes place. The slow development of the leaves, however, is connected with the necessity for new root formation. This begins only when the soil temperature has reached 10–15° C.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See also Nos. 212, 222, 292, 295.

257. BHATNAGAR, H. P. **The effect of root competition on the growth of Sal [*Shorea robusta*] natural regeneration.** *Indian For.* 85 (7), 1959 (408–14). 6 refs.

There is appreciable competition between Sal seedlings and herbs and shrubs as well as between Sal seedlings and larger trees, the former effect

being much more pronounced. The growth peaks of Sal seedlings occur during the periods 15th April–15th May, 15th June–15th July, and 15th August–15th September, the first and last being more important. Since, during these periods, the demands of actively growing Sal seedlings are maximum, the competition from other plants is intense. If weeding is carried out during these periods or somewhat in advance, i.e., in late winter or early summer and/or in late rains, it will help to relieve the intense competition between the Sal seedlings and associated flora, and lead to accelerated growth of the former. The elimination of root competition from larger trees by trenching is impracticable. *From author's summary.*

181.5. Reproductive Behaviour

See also Nos. 101, 105, 212, 320, 344 *et seq.*, 376 *et seq.*

258. SUTTON, R. F. **An unusual case of vegetative reproduction of White Birch.** *For. Chron.* 35 (2), 1959 (112–3).

Describes (with photograph) a fallen tree of *Betula papyrifera*, whose roots were not severed, from the stem of which 4 branches continued to grow and eventually developed root systems of their own.

259. MAY, S. Una manifestazione di bisessualità nel pioppo nero americano. [**A case of bisexuality in *Populus deltoides*.**] *Cellulosa e Carta* 10 (7), 1959 (6–8). 1 ref. [It.f.e.g.]

Androgynous inflorescences were observed on a 4-year-old *Populus deltoides* raised from seed obtained from Alabama. Seed has been collected from the tree and the resulting seedlings are under observation at Casale Monferrato. This is believed to be the first record of bisexuality in a Black Poplar, and its possible importance for breeding is discussed.

260. MCWILLIAM, J. R. **The rôle of the micropyle in the pollination of *Pinus*.** *Bot. Gaz.* 120 (2), 1958 (109–17). 31 refs. O.B.D.

The structure and function of the micropyle was studied in 3 species of *Pinus*, and its rôle in pollination is described.

261. WACHTER, H. Beobachtungen über das Früchten von Junglärchen in Verbindung zu vorausgegangenen Spätfrostschäden. [**Fruiting of young Larches in relation to damage by previous late frosts.**] *Silvae Genet.* 8 (4), 1959 (105–6). 4 refs. [G.g.e.f.]

Young Larches damaged by late frost fruited heavily in the following year. Heaviest fruiting occurred in those that suffered the greatest setback in height growth. Trees that maintained a good growth in comparison with the previous year produced no flowers at all.

262. EISENHUT, G. Beiträge zur Kenntnis der Blütenbildung und Fruchtentwicklung in der Gattung *Tilia*. [**Formation of flower buds and development of fruit in the genus *Tilia*.**] *Flora, Jena* 147 (1), 1959 (43–75). 29 refs. [G.g.] O.B.D.

Observations were made on several species of *Tilia* and data are presented on stages in and factors affecting the formation of flower buds, pollination processes, pericarp and seed development, seed weight and quality, factors affecting fruit formation and fall, and the distribution of fruit on the tree. Experiments were made on the effects of introducing nutrient salts via bore holes in branches. Salts containing N and P significantly increased fruit formation.

263. KALOYEREAS, S. A. **Rancidity as a factor in the loss of viability of Pine and other seeds.** *Journal of the American Oil Chemists Society, Chicago* 35 (4), 1958 (176–9). 19 refs. P.O.

A 3-year study of factors affecting the germination of *Pinus jeffreyi* and *P. lambertiana* showed a certain correlation between development of rancidity in the fat and loss of viability as shown by germination and tetrazolium-chloride tests. Coating okra, onion and Pine seeds with starch phosphate (an antioxidant) gave a much higher germination % compared with controls in okra seeds, but had little effect on Pine.

264. KATSUTA, M. [**Physiological studies of the ripening and germinating processes of Pine seeds. 1. Changes of seed proteins.**] *Bull. Tokyo Univ. For.* No. 55, 1959 (125–59). 13 refs. [Jap.c.e.]

The proteins found in ripe seeds of *Pinus thunbergii* and *P. densiflora* were glutelin, albumin, globulin and prolamin, of which the first was the most and the last the least abundant. The main protein in the embryo was albumin and that of the endosperm glutelin. Changes in amino-acid composition of the proteins during the ripening process proceeded independently for each protein. [Cf. *F.A.* 15 Nos. 2250–1.]

265. JUDIN, V. G. Fiziologičeskie issledovanija processov sozrevanija semjan nekotoryh vidov klena. [**Physiological investigations on the processes of ripening in seeds of some *Acer* species.**] *Bot. Ž.* 44 (4), 1959 (559–62). 5 refs. [Russ.]

Tabulates and graphs the changes in the moisture, dry matter and carbohydrate content of the seeds and wings, and in the content of fats and respiration of the seeds of *A. platanoides* and *A. tataricum* taken from the same part of the tree from 24th July to 7th Oct. The physiological trends during ripening (reduction of m.c., increase of dry matter, carbohydrates and fats, and reduction of respiration) were the same for both species but proceeded at different rates.

266. OLSON, J. S., STEARNS, F. W., and NIENSTAEDT, H. **Eastern Hemlock seeds and seedlings: response to photoperiod and temperature.** *Bull. Conn. Agric. Exp. Sta.* No. 620, 1959. pp. 70. 58 refs.

[Cf. *F.A.* 20 No. 268.] Laboratory experiments showed that both seeds and seedlings of *Tsuga canadensis* exhibit marked dormancy in autumn. Chilling for ⩾ 1 month at temperatures slightly above freezing permits them to grow when returned to favourable temperatures. The chilling requirement is not absolute: repeated daily cycles of light and darkness of appropriate duration can also lead

to resumption of growth, though somewhat less promptly than for seeds or buds that have been previously chilled. Photoperiodism is also evident in the return of growing stems to a dormant condition by the formation of new terminal buds. The duration and amount of growth decrease gradually as night-length increases; the most marked decrease occurs when night-length increases beyond 8–9 hours (slightly longer for seedlings of southern than for those of northern origin). Both seeds and seedlings show a fairly narrow range of optimum temperatures for germination and maximum growth. For most rapid germination, the range is 55–70° F.; for elongation 60–80°. Although long-day and short-night conditions are consistently best for stem growth, there is a marked change in the optimum photoperiod for the germination of unstratified seed with changing temperature, e.g. 8-hour photoperiods are relatively favourable within the optimum temperature range, but relatively unfavourable at higher (and possibly also at lower) temperatures. On the basis of these findings, recommendations are made for seed collection and storage and for nursery practice.

267. Black, M., and Wareing, P. F. **The rôle of germination inhibitors and oxygen in the dormancy of the light-sensitive seed of *Betula* spp.** *J. exp. Bot.* 10 (28), 1959 (134–45). 17 refs. O.B.D.

Although unchilled, intact seeds of *Betula pubescens* and *B. verrucosa* require light for germination, isolated embryos germinate equally well in both light and darkness. A non-fluorescent, single substance extracted by water from these seeds has germination-inhibitory properties, and, when applied to the isolated embryos, restores their light requirements. When intact seeds are leached with water, their light requirements for germination are reduced. Scratching, pricking and cutting the seed-coat increase the germination of intact seeds in darkness, probably owing to increased entry of O. It was also found that germination in short days is increased in O-enriched atmospheres. Although the inhibitory effect of the seed-coat in intact seeds is partially due to the reduction of the O supply to the embryo, a low O concentration does not prevent germination of isolated embryos. Experimental results suggest that the inhibitor in the seed-coat increases the O requirement of the embryo. *From authors' summary.*

268. Vaartaja, O. **Photoperiodic response in germination of four species of *Betula*.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (3), 1959 (2).

Reports, with tabulated data, the results of a test of photoperiodic requirements of seed of *B. papyrifera*, *B. mandshurica* var. *japonica*, *B. glandulosa* and *B. lenta*. [Cf. *F.A.* 17 No. 2579.]

269. Benzie, J. W. **Sugar Maple and Yellow Birch seed dispersal from a fully stocked stand of mature northern hardwoods in the upper peninsula of Michigan.** *Tech. Note Lake St. For. Exp. Sta.* No. 561, 1959. pp. 1.

A study on a 10-acre clear felling indicated that in good seed-years an adequate amount of seed can be expected for at least 5 chains in all directions from an old-growth mixed stand.

270. Zahariev, B. J., and Conev, V. Studoizdrăžlivost na žălădi ot červen dăb. [**The sensitivity of *Quercus borealis* acorns to freezing.**] *Nauč. Trud. Lesoteh. Inst., Sofia* No. 6, 1958 (29–46). 13 refs. [Bulg.bulg.g.]

Refrigerator tests were carried out during the years 1955/56 to 1957/58 to examine the behaviour of acorns (moisture content in most cases ca. 44–55%) exposed to −15°, −10° and −7° C., followed by germination tests in soil in a greenhouse. Exposure to −7° for 15 days caused no damage to the acorns, and germination was normal. At −10°, 10–20% of the acorns were killed in the first 24 hours; losses continued thereafter, but did not increase very rapidly or seriously. At −15° some acorns were killed after 2 hours, and most were dead after 8 hours. In one of the tests at −10°, drying the acorns from 55·8 to 43·9% m.c. reduced their frost resistance, though in unrefrigerated controls there was little difference in germination % between dried and undried acorns. Freezing caused three main forms of damage: total death of the embryo; total death of the plumule, in which case the acorns formed no stem but only a very branched root; or partial damage to the radicle, resulting in a branched root-system instead of a taproot.

271. Kriebel, H. B. **Geographic differentiation in seed dormancy and juvenile growth rate of Ontario Sugar Maple.** *Proc. 6th Mtg. Comm. For. Tree Breeding Can., Montreal, 1958, Part 2*, 1958 (*R7–R11*).

Seed from 3 sources varied in time and rate of germination, indicating geographic variation in chilling requirements of the seed. Seed from the most southerly source (lat. 44° 17′) germinated in stratification considerably earlier than that from the more northerly sources (46° 28′ and 46° 04′). The differences continued to be apparent in rate of seedling development.

272. Is[h]ikawa, I. [**Hard seed of *Acacia mollissima* Willd. in relation to the position of seeds in legume.**] *Bull. Tokyo Univ. For.* No. 55, 1959 (171–9). 13 refs. [Jap.e.*e.*]

Pods were collected from a 13-year-old tree, and a comparison made of the hardness (measured by time taken to germinate) of seed from (*a*) base, (*b*) middle, and (*c*) tip of the pods. The proportion of hard seed was high in (*c*) at all times, but low or non-existent in (*a*) and (*b*) in Oct., gradually increasing from Nov. onwards. A year and a half after the germination test, most hard seed from (*b*) had swelled and some from (*a*), but those from (*c*) were still dormant.

273. Watanabe, A. [**Effects of drying of soil upon the germination of seeds and upon the water relations of seedlings of *Acacia mollissima***]. *Bull. Tokyo Univ. For.* No. 55, 1959 (161–9). 13 refs. [Jap.e.*e.*]

After immersion for 5 min. in water at 100° C., seed was sown in pots with soil of different m.c. Germination was not affected at m.c. > 20%, but

decreased suddenly below that point, and % germination declined to one-half of initial germination just before permanent wilting point (14·5%) was reached. The transpiration rate of seedlings diminished suddenly at soil m.c. just below 30%, but water content of leaves was not reduced until near permanent wilting point.

274. HUNG, L.-B. **[Preliminary study on the seed of Teak.]** *Bull. Taiwan For. Res. Inst.* No. 59, 1958. pp. 10. 6 refs. [Chin.chin.e.]

Studies were made on the number of seeds per nut, their germination and survival, using 1000 nuts selected at random from 32-year trees at Chung-puh. The mean number of seeds per 100 nuts was 171, and the mean weight of 100 nuts 67·5 g.; 41·6% of the nuts had 2 seeds and 37·4% 1 seed, the rest 3, 4 or 0 seeds. Nuts were soaked in water (24 hr.) and sun-dried (48 hr.) five times, then sown in earth-filled bamboo tubes, 4 to a tube, out of doors. Germination began 18 days after sowing and increased to a maximum during the next 15 days, thereafter decreasing slowly until the end of the period of germination (50 days). Germinative capacity was 61·22%. Germination and survival %s, based on the nuts, were 60·8 and 54·6% respectively, and based on the seeds 34·1 and 30·4%. The mean number of nuts per litre was 466, giving a germination of 284 and survival of 255. A direct linear relation was found between germination and survival. *From author's summary.*

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 83–4, 821–9, 847–9.

275. REUKEMA, D. L. **Missing annual rings in branches of young-growth Douglas-Fir.** *Ecology* 40 (3), 1959 (480–2). 4 refs.

A striking lack of agreement between the number of annual rings at the bases of live branches and in tree stems at their point of intersection was observed during a study of normal crown die-off in young-growth Douglas Fir. Seven trees aged 35–70 years were analysed, and it was found that the difference between bole age and apparent branch age in the lower whorls of the live crown was as much as 15 years on one tree; discrepancies of 9–10 rings were not uncommon. There were no observed indications, other than the position of the branches in the crown, that the branches should be growing poorly. It is inferred that the lower branches may contribute little or nothing to tree development, and this may be an argument in favour of pruning live branches from young Douglas Fir. There is a possibility that increment may even be raised by pruning these branches [cf. *F.A.* 16 No. 4092].

181.7. Duration, Longevity, Stature; Records of Exceptional Age or Size. Effects of Age on Behaviour

See also No. 81.

276. ZARĘBA, R. Maksymalne wymiary drzew Białowieskiego Parku Narodowego. **[Maximum dimensions of trees in Białowieża National Park.]** *Sylwan* 102 (1), 1958 (59–67). 3 refs. [Pol.russ.e.]

Tabulates d.b.h., height and location of the biggest specimens of Oak, Spruce, Pine, Lime, Ash, Maple, Elm, Alder, Hornbeam, Aspen and Birch.

181.8. Phenology

See also Nos. 66, 77, 80–5, 101, 137, 208–11, 213–4, 256, 359, 484, 849.

277. ANDREEV, V. N., and VAHTINA, T. V. Vlijanie prizemnogo klimata na fenologiju rastenij v Subarktike. **[The influence of surface climate on the phenology of plants in the [Soviet] Subarctic.]** *Priroda, Moskva* 48 (6), 1959 (96–7). [Russ.] A.P.B.

A brief account of observations made, *inter alia*, on *Larix sibirica*, *Alnus fruticosa* and *Betula nana* growing in tundra regions, to assess the significance of surface climate conditions on vegetation and the possibility of agricultural development.

278. TOMESCU, A. Fazele periodice de vegetație în anul 1954. **[Vegetative periods in the year 1954.]** *An. Inst. Cerc. Silv., Bucureşti (Ser. I)* 18, 1957 (47–76). 12 refs. [Rum.russ.f.]

Presents and discusses phenological data collected at 99 stations in Rumania for 17 species (*Picea abies*, *Alnus glutinosa*, *Carpinus betulus*, *Corylus avellana*, *Fagus sylvatica*, *Quercus cerris*, *Q. robur*, *Q. sessiliflora*, *Ulmus campestris*, *Robinia pseudoacacia*, *Acer platanoides*, *A. pseudoplatanus*, *A. campestre*, *Tilia tomentosa*, *Cornus mas*, *Fraxinus excelsior* and *Sambucus nigra*). The factors investigated were dates of budding, flushing, and flowering in relation to air and soil temperatures, and length of growing season.

279. RIABININ, S. Wyniki obserwacji nad fenologią owadów, ptaków i roślin. **[Results of observations on the phenology of insects, birds and plants.]** *Ekologia Polska, Warszawa* 6*A* (8), 1958 (293–314 + 6 tbls.). 113 refs. [Pol.e.] O.R.S.

Presents the results of observations in Poznan in 1946–50 and in Lublin 1951–55. Plant species included *Acer negundo* and *A. platanoides*, *Corylus avellana*, *Aesculus hippocastanum*, *Alnus glutinosa*, *Sorbus aucuparia*, *Ulmus campestris*, *Robinia pseudoacacia*, *Betula verrucosa* and *Tilia* sp.

280. GEORGOPOULOS, A. Sur la phénologie des peupliers. **[Notes on the phenology of Poplars.]** *Schweiz. Z. Forstw.* 110 (8), 1959 (542–554). 18 refs. [F.g.]

Observations on flushing time and cessation of height growth of 16 hybrid clones from 5 countries, raised from cuttings at Strymon, Greece. The Swiss clone 07/5 (*Populus angulata* × *P. trichocarpa*) was the earliest flusher, followed by the Italian I 214 (*P. carolinensis* × *P. nigra*), two clones of *Populus* × *serotina* being the latest. [Cf. *F.A.* 17 No. 310.]

182. Synecology, Plant Sociology: General, Principles and Methods

182.1. Palaeoecology. History of Vegetation. Pollen Analysis

See also Nos. 102–4, 160, 205.

281. BARKER, H. **Radio carbon dating: its scope and limitations.** *Antiquity* 32 (128), 1958 (253–63). 13 refs. O.G.

Answers criticisms of the method and re-states the principles underlying the technique.

282. DURNO, S. E. **Certain aspects of vegetational history in North-East Scotland.** *Repr.* from *Scot. geogr. Mag.* 73, 1957 (176–84). 15 refs.

Discusses changes in the distribution and composition of forests, under the influence of climate and man, from Boreal to modern times, based on pollen analyses from 8 coastal and inland peat mosses.

283. VANSELOW, K. Der Bestockungswandel in den bayrischen Staatswaldungen des Spessarts im Laufe der Zeit. **[Changes in the species composition of the Bavarian state forests in the Spessart region in the course of time.]** *Allg. Forstzeitschr.* 14 (32; 33), 1959 (557–9; 576–9). 7 refs. [G.]

Traces prehistoric and historic changes, particularly the spread of Beech at the expense of Oak, the failure (except in isolated areas) of natural Oak regeneration, and the introduction (at first for the conversion of degraded scrubland) of conifers, which now occupy ca. ½ of the area.

284. MUNAUT, A. V. Première contribution à l'étude palynologique des sols forestiers du district picardo-brabançon. **[Pollen analysis of forest soils in Picardy and Brabant.]** *Bull. Soc. For. Belg.* 66 (7), 1959 (361–79 + 2 gphs.). 10 refs. [F.]

An essay in deducing the history of two forest sites from pollen analyses at different depths. In one case original forest had been cleared and succeeded by pasture, arable and heath before being replanted, in the other the forest had come back by natural succession after the original forest had been cleared for pasture.

285. LAWRENCE, D. B. **Glaciers and vegetation in South-eastern Alaska.** *American Scientist, Easton, Pa.* 46 (2), 1958 (89–122 + 1 plate). 69 refs. L.S.

Traces the history of glaciers, chiefly of the Juneau ice fields, partly from the evidence of vegetation, including fossil forests; discusses the reasons for the climatic changes resulting in a period of maximum extension in the second half of the 18th century both in N. America and N. Europe; and describes the succession of vegetation following ice recession, from low pioneer species via Alder thicket (N fixation) to high forests of Spruce and Hemlock, and finally forest deterioration and muskeg development.

286. COTTAM, W. P., TUCKER, J. M., and DROBNICK, R. **Some clues to Great Basin postpluvial climates provided by Oak distribution.** *Ecology* 40 (3), 1959 (361–77). 26 refs.

Hybrids between *Quercus gambelii* and *Q. turbinella* have been found on the foothills of the Wasatch Mountains in north-central Utah and along the eastern boundaries of Lake Bonneville. *Q. gambelii* is common in this region but the present northern limits of *Q. turbinella* in southern Utah lie some 260 miles south of the most northerly hybrids. After discussing the problem, the authors conclude that the post-pluvial altithermal period of Antevs, which lasted from ca. 7500 to ca. 4000 years ago and was marked by a warmer and drier climate than the present, provided the necessary conditions for the northwest migration of *Q. turbinella*. Then, in the subsequent medithermal period, climatic conditions once more became sufficiently cool to exterminate *Q. turbinella* but not the hardier hybrid.

287. AXELROD, D. I. **Late Cenozoic evolution of the Sierran Bigtree forest.** *Evolution* 13 (1), 1959 (9–23). 35 refs. O.R.S.

Discusses the composition of the modern and the late Tertiary forests, and outlines provisionally the evolution of the modern forest.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 282–5, 287, 296, 300.

288. DECKER, J. P. **A system of analysis of forest succession.** *For. Sci.* 5 (2), 1959 (154–7). 6 refs.

In the search for a physiological explanation of succession, consideration of succession at the community level is more complex than consideration of the life histories of individual plants. The idea of systematic analysis of a life history as a 'plane of events' is expounded, with examples; if the idea is applied to succeeded trees, it facilitates explanation of forest succession.

289. MELEHOV, I. S. Svjaz' tipov vyrubok s tipami lesa. **[Types of vegetation on [clear-] felled areas in relation to forest types.]** *Bot. Ž.* 44 (3), 1959 (349–52). [Russ.]

Discusses the development of different vegetation types on clear fellings in different forest types in N. Russia, (*a*) after burning, and (*b*) unburned. A diagram of the possible initial stages of secondary succession is presented. The author stresses the importance for silviculture of distinguishing such types and the ecological conditions that they indicate.

290. MARTIN, N. D. **An analysis of forest succession in Algonquin Park, Ontario.** *Ecol. Monogr.* 29 (3), 1959 (187–218). 47 refs.

Although there was often great diversity in the tree composition of forests, there was a general pattern of forest succession, with a hydrosere on wet ground and a xerosere on uplands. The time required for one community to replace another may be long in the hydrosere, because primary succession depends upon change in the physical environment. In the xerosere the time is relatively short, for secondary succession, because a favourable soil habitat is already present.

291. VECHTEN, G. W. VAN, and BUELL, M. F. **The flood plain vegetation of the Millstone River, New Jersey.** *Bull. Torrey Bot. Cl.* 86 (4), 1959 (219–27). 9 refs. O.B.D.

Describes the succession of vegetation on abandoned agricultural land in this region. Woodland now occupies 49% of the plain.

292. BUELL, M. F., and BUELL, H. F. **Aspen invasion of prairie.** *Bull. Torrey Bot. Cl.* 86 (4), 1959 (264–5). 2 refs. O.B.D.

A study of the root systems of Aspen on prairie in Mahnomen County, Minn., suggests that, whereas

fire formerly kept the Aspen groves reduced and the trees small, settlement and the practice of harvesting wild prairie hay have protected the groves and resulted in vigorous growth of Aspen and of their long, propagating roots.

293. WOODS, F. W., and SHANKS, R. E. **Natural replacement of Chestnut by other species in the Great Smoky Mountains National Park.** *Ecology* 40 (3), 1959 (349–61). 48 refs.

Castanea dentata has been virtually eliminated from these forests, where it was formerly dominant, by *Endothia parasitica*, introduced ca. 1900. The present study is concerned with the natural replacement of Chestnut and consequent changes in forest composition in the Southern Appalachian region, based on data from 79 stands and 2569 individual openings created by the death of Chestnut. The most abundant species replacing Chestnut were *Quercus prinus* (17%), *Q. rubra* (16%), *Acer rubrum* (13%). *Quercus* spp. made up 41% of the replacement. No indication was found that the Chestnut would recover or regain its former dominant position. The former Oak/Chestnut forest association is in process of developing into an Oak association complex in which *Q. prinus* and *Q. rubra* are likely to be particularly important. [Cf. *F.A.* 19 No. 1523.] *From authors' summary.*

182.3. Units of Vegetation (Associations etc.: Theory)

See Nos. 298–9.

182.4. Layer Communities

See also Nos. 212, 297.

294. BROWN, B. A. **Factors related to upland-brush density in natural Jack Pine stands of North Central Minnesota.** *Minn. For. Note* No. 80, 1959. pp. 2. 2 refs.

A statistical analysis of sample plot data in *Pinus banksiana* stands, substantiating earlier findings [cf. *F.A.* 16 No. 3114]. The logarithm of brush density was found to be related linearly to silt-and-clay content of the soil, to b.a. and mean d.b.h. of the stand, and to site index, and curvilinearly to stand age, brush age,and number of brush species.

295. FAYLE, D. C. F. **The point contact method as a three-dimensional measure of ground vegetation.** *For. Chron.* 35 (2), 1959 (135–41). 4 refs.

A measure of the quantity of vegetation competing with Yellow Birch seedlings on quarter-milliacre plots was needed to provide a comprehensive picture of seedling development. The point-contact method of sampling vegetation was chosen because, with modifications to the technique, the structure, distribution and composition could be measured. Basically the method involves dropping a rod (point) vertically through the vegetation and recording the plants touched (contacts) by the rod at a large number of these points. Features of the method, considerations in application, and the technique developed for this particular study are discussed. *From author's summary.*

182.5. Synecological Measurements and Methods

See No. 295.

182.8. Ecology of Artificial (Cultivated) Plant Communities etc.

296. WESTHOFF, V. **The vegetation of Scottish Pine woodlands and Dutch artificial coastal Pine forests; with some remarks on the ecology of *Listera cordata*.** *Acta bot. neerland.* 8 (4), 1959 (422–48). 62 refs. [E.e.] O.B.D.

Presents the results of analyses of vegetation in 6 different localities in the Scottish Highlands and compares them with the vegetation developing under artificial Scots Pine stands in Holland. The author concludes that a further development may be expected of the Pine forests of Terschelling into a well defined association of the *Piceion septentrionale*. This is mainly due to the exceptionally low lime content of the Terschelling dune sand, favouring the establishment of species of the boreal coniferous woodland formation. Such a development is less probable on Ameland and Schiermonnikoog.

297. RHEINHEIMER, G. Veränderungen der relativen Beleuchtungsstärke und der Bodenvegetation in einem Fichtenforst. **[Changes in relative intensity of illumination and ground vegetation in a Spruce forest.]** *Ber. Dtsch. Bot. Ges.* 72 (5/6), 1959 (246–50). 3 refs. [G.] O.B.D.

Presents charts based on data collected on a 5 × 6-m. plot in an 80-year-old forest S.W. of Hamburg.

187. Vegetation Types

See also Nos. 6, 23, 43, 221–2, 289–93, 296, 323, 325, 347, 456, 1270.

298. BAKUZIS, E. V. **Synecological coordinates in forest classification and in reproduction studies.** *Abstr. of thesis*, in *Dissert. Abstr.* 20 (1), 1959 (14–5). O.R.S.

Part 1 discusses the historical development of the method. Part 2 presents a re-organization of the forest synecological classification of Latvia, based on an analysis of the dynamics of natural reproduction on clear-cutting strips from 443 sampling areas, with the aid of moisture/nutrient co-ordinates. Part 3 analyses 356 Minnesota forest communities with the aid of moisture, nutrient, heat and light co-ordinates, establishing co-ordinate values for separate species, computing community values on the basis of species presence, and determining regional changes within Minnesota.

299. MRÁZ, K., and SAMEK, V. Metodika typologického výzkumu lesů. **[Methods in forest typology.]** *Věd. Práce Výzkum. Ust. Lesa Mysl., Praha* No. 1, 1957 (53–70). 44 refs. [Cz.russ.g.]

Examines the principles of forest typology [cf. J. Pelišek, *F.A.* 17 No. 3750] showing its dependence on the techniques of forest ecology, pedology, palaeontology, and, especially, phytocoenology, and, following the Soviet typologist Pogrebnjak, distinguishes its basic elements [cf. *F.A.* 17 No. 3751] and evaluates its rôle in forest cartography.

300. SCURFIELD, G. **The Ashwoods of the Derbyshire carboniferous limestone: Monk's Dale.** *J. Ecol.* 47 (2), 1959 (357–69). 15 refs.

A description of climate, soils, and vegetation. Height and diameter growth were better on the E. than on the W. slopes, presumably because of the greater exposure of the latter to sun and wind. Three successional sequences leading to Ash woods are traced: bare scree → *Corylus avellana* + *Fraxinus excelsior* scrub → *F. excelsior* woodland; bare scree → *F. excelsior* woodland direct, and grassland (grazed); *Crataegus monogyna* scrub → *C. monogyna* + *F. excelsior* → *F. excelsior* woodland. In the ground flora, *Deschampsia caespitosa* or *Brachypodium sylvaticum*, both generally with *Mercurialis perennis*, become dominant.

301. CORILLION, R. Carte de la végétation de la France. Alençon. **[Vegetation map of France. Alençon.]** Centre National de la Recherche Scientifique. 1957. 1 sheet. [F.] Scale 1:200,000.

Shows areas of natural and introduced vegetation (indicating tree species and agricultural crops). Small-scale inset maps show soils, land use, climate, relief etc. Explanatory notes deal mainly with geographical and botanical divisions.

302. HILD, J. Die Bruchwald- und Gebüschgesellschaften im Schwalmtal. Ein Beitrag zur floristischen Soziologie des Niederrheingebietes. **[The swamp forests and shrub associations of the Schwalm valley. Contribution to the plant sociology of the lower Rhine.]** *Ber. Dtsch. Bot. Ges.* 72 (5/6), 1959 (191–201). 5 refs. [G.g.] O.B.D.

Two subassociations are distinguished and described in the Alder swamp forests. The shrub associations are secondary, either resulting from or developing towards an *Alnetum*.

303. SCHÖNNAMSGRUBER, H. Mineralstoffuntersuchungen an Waldgesellschaften Baden-Württembergs. 1. Buchen-Eichenwald auf weissem Schlufflehm (Hohenloher Ebene). **[Investigations into the mineral content of the forest associations of Baden-Württemberg. 1. Beech/Oak forest on white silt loam (Hohenloher Ebene).]** *Ber. Dtsch. Bot. Ges.* 72 (5/6), 1959 (220–9). 34 refs. [G.] O.B.D.

Presents data on the mineral content of the soils and of the vegetation (both of individual species and of ecological units).

304. WOLAK, J. Fitosocjologiczne zróżnicowanie borów sosnowych na obszarze Krainy Wiżów Środkowo-Polskich. **[Phytosociological differentiation of the Pine forests in upland areas of Central Poland.]** *Prace Inst. Bad. Leśn.* No. 191, 1959. pp. 52 + 1 tbl. 25 refs. [Pol.russ.f.]

Classifies the region, which is near the S. limit of *Pinus sylvestris* forest, into 10 climax associations: the *Pineto-Cladonietum rangiferinae* (with 2 variants); *P.-Vaccinietum myrtilli* (with 4 variants); *P.-V. uliginosi*; and the *P.-Quercetum*.

305. MORK, E., and LÅG, J. Vegetasjonen i Ulvsjøberget forsøksområde. **[The vegetation of the Ulvsjøberg experimental area [Hedmark, E. Norway].]** *Medd. Norske Skogforsøksv.* 16 (1), No. 53, 1959 (43–79 + 1 map). 9 refs. [Nor.nor.e.]

The vegetation types are: (1) types on firm ground (*Dryopteris, Myrtillus, Calluna, Calluna/Myrtillus* and *Empetrum* types); (2) swamp forest types (*Vaccinium, Calluna* and *Equisetum*); (3) wet peat types (*Carex globularis, C. rostrata, C. lasiocarpa, Scirpus, Eriophorum, Sphagnum fuscum* and *S. cuspidatum*).

306. TÓTH, I. Az alsó-dunaártér erdögazdálkodása termöhely- és az erdötípusok összefüggése. **[Forestry in the flood-plain area of the lower Danube—the relation between forest types and site.]** *Erdész. Kutatás., Budapest* 1958 (1/2), (77–160 + 1 map). 70 refs. [Hu.russ.e.g.]

Elaborates the relation between forest types, the soil types, and the water regime (particularly the depth of the water table and periodic flooding). The flood resistance of the various forest types, and the influence of man, deer and flooding on yields, are discussed, and a method of site investigation suggested.

307. EM, H. O šumama smrče u NR Makedoniji. Prethodno saopštenje. **[Spruce forests in Macedonia. A preliminary report.]** *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 11, 1957/1958 (37–42). 9 refs. [Serb.g.]

Describes their distribution and main floristic features.

308. IVANOV, V. V. Ostatki lesov v dolinah Uzenej. **[The remains of forests in the [Great and Little] Uzen rivers [pre-Caspian lowland].]** *Bot. Ž.* 44 (1), 1959 (109–12). [Russ.]

Tabulates data on air temperatures at 1·5–2 m. and at ground level, r.h., and soil temperatures at 20 cm., in 7 different associations in the Gt. Uzen valley, 10–12 km. S. of Aleksandrov-Gai. The trees found included *Salix viminalis, S. triandra, Tamarix pallasii, Ulmus laevis, Prunus spinosa, Acer tataricum* and *Populus alba*. The author believes that up to the early 19th century there existed in the valley quite large forests, since then almost entirely destroyed by man, and that reforestation of these valleys is both desirable and practicable.

309. KAO, S.-W. **[Characteristics of the deserts in N. China and their transformation.]** *For. Sci., Peking* No. 4, 1959 (279–98). 7 refs. [Chin.russ.]

Discusses their location and types, and names 19 plants that grow there and could be used for sand fixation. These include *Elaeagnus angustifolia, Populus simonii, Tamarix ramosissima, T. laxa, Haloxylon ammodendron, Salix cheilophylla, S. flavida, Caragana korshinskii*, etc.

310. YAMANAKA, T. **The *Pinus densiflora* forest on serpentine.** *Japanese Journal of Ecology* 9 (1), 1959 (54–8). [Jap.e.] From *abstr.* in *Biol. Abstr.* 33 (10), 1959 No. 36465.

A study of this forest type was made near Kochi City. The vegetation in this district consists of open stunted stands of *P. densiflora* with deciduous shrubs. The floristic composition is very different from that of Pine forest on other rocks. It is classified as a *Pinus densiflora/Abelia serrata* association and may be regarded as an edaphic climax within the area of the warm-temperate forest region.

311. SHANKARNARAYAN, K. A., and GUPTA, R. K. **The vegetation of Coimbatore district.** *Indian For.* 85 (9), 1959 (533–41 + 3 photos, 1 map). 11 refs.

312. RAMSAY, D. M. **The forest ecology of Central Dafur.** *For. Bull. For. Dep. Sudan.* (*n.s.*) No. 1, 1958. pp. vii + 80 + 4 maps. 13 refs. Price *Piastres* 50.

Includes a description of the area and data on its environmental factors, a classification of the vegetation and correlations with that of West Africa, a detailed description and discussion of the formations, based on plot enumerations and route sampling, and a list of the trees, shrubs and grasses. The formations recognized are semi-desert scrub (3540 sq. miles), thorn savanna (33,458), woodland savanna (22,790) and mountain vegetation (376), with 12 associations.

313. ADAM, J. G. Éléments pour l'étude de la végétation des hauts plateaux du Fouta Djalon (Secteur des Timbis), Guinée Française. Première partie: La flore et ses groupements. **[Elements of a vegetation study of the high plateaux of Fouta Djalon (Timbis sector) French Guinea. I. The flora and its [plant-sociological] grouping.]** Bureau des Sols, Direction des Services Économiques, Gouvernement Général de l'A.O.F., Dakar. [1958?] pp. 80 + 1 map, 3 dgms. [F.]

Includes a brief description of soils and vegetation types, a vegetation map, and a plant list of a sample area, with indications of frequency, degree of gregariousness etc.

314. ROWE, J. S. **Forest regions of Canada.** *Bull. For. Br. Can.* No. 123, 1959. pp. 71 + 1 map. 41 refs.

A study based on W. E. D. Halliday's 'A forest classification for Canada', published in 1937, but including additional data gathered over the last two decades. The forests are described by regions, conceived as a major geographic belt or zone characterized vegetationally by a broad uniformity both in physiognomy and in the composition of the dominant tree species. The regions are subdivided into sections that again are geographic areas, with a distinctive pattern of vegetation and physiography. A map is included and an appendix with selected climatic data.

315. MCINTOSH, R. P. **Presence and cover in Pitch Pine/Oak stands of the Shawanguk Mountains, New York.** *Ecology* 40 (3), 1959 (482–5). 14 refs.

316. **British Honduras, natural vegetation map. Sheet 1** [N.], **Sheet 2** [S.]. Directorate of Overseas Surveys, Tolworth. [1959.] 2 sheets. Scale 1:250,000.

317. BASCOPÉ, F., *et al.* Descripciones de árboles forestales No. 5. Los manglares en América. **[Descriptions of forest trees No. 5. Mangrove forests in America.]** Instituto Forestal Latino Americano de Investigación y Capacitación, Mérida. 1959. pp. 52 + 16 photos. 59 refs. [Span.]

A monograph in 3 parts. (1) *Botany*: Presents information on the distribution of Mangrove swamps in the Americas with particular reference to S. America, succession in Mangrove communities and the most important Mangrove species, including their ecological characters, distribution, methods of dispersal and nomenclature. (2) *Silviculture*: Describes the ecological and silvicultural characteristics of Mangrove swamps and of individual species and the silvicultural methods most suited to them. Injuries and diseases are also dealt with. (3) *Wood*: Gives data on the anatomy of woods of *Rhizophora* spp. (including *R. mangle*), *Avicennia* spp. (including *A. nitida*), *Laguncularia racemosa* and *Conocarpus erectus*, their physical and mechanical properties and uses, including tannin extraction.

318. MEIJER, W. **Plant sociological analysis of montane rain forest near Tjibodas, West Java.** *Acta bot. neerland.* 8 (3), 1959 (277–91). 14 refs. [E.e.] O.B.D.

Presents the results of an inventory in the nature reserve at ca. 1500 m. alt., in which all trees with d.b.h. > 10 cm. were named and counted. Such an intensive study of a relatively small part of the forest included about ¼ of the flora of the montane region. The upper storey of the forest is composed chiefly of species of *Quercus*, *Castanea*, *Altingia*, and *Schima*, while Lauraceae and *Eugenia* spp. predominate in the understorey. Half of the tree species represented in the sample plot occurred only once there and ca. 13 tree species were found only in the juvenile state. Good regeneration was found of all the more common species. On a single hectare, 333 spp. of phanerogams and ferns were found, including 78 trees, 40 shrubs, 73 herbs and ca. 100 epiphytes. *From author's summary.*

319. MOORE, C. W. E. **The nutrient status of the soils of some natural plant communities on the southern tablelands of New South Wales.** *Ecology* 40 (3), 1959 (337–49). 60 refs.

Soils were collected from a number of natural plant communities and their nutrient status assessed by pot cultures of oats and clover. Responses to Ca, N, P, K, and S were obtained on most soils, and significant differences between communities were demonstrated in respect of N, P, K, and Ca. There is no evidence that the nutrient status of the soils, as determined by the growth of oats and clover, influences the relative distribution of the two subalpine communities compared (*Eucalyptus pauciflora*/*E. nitida* woodland and *Poa caespitosa* grassland). There is evidence that an edaphic factor operates in the delimitation of the *E. rossii* dry sclerophyll forest and the *E. melliodora* or *E. pauciflora* woodlands, and that the Ca status of the soil may be a factor of some importance; the dry sclerophyll forests usually occur on soils that are grossly deficient in Ca. Where *E. rossii* is dominant, it is unlikely that pasture improvement by the use of subterranean clover will be successful in the absence of lime. *From author's summary.*

320. GILBERT, J. M. **Eucalypt-rainforest relationships and the regeneration of the Eucalypts.** Australian Newsprint Mills Limited, Hobart, Tasmania. 1958. pp. 5 + 123 + 3 maps, 27 photos, 5 dgms., 24 gphs. 42 refs. Limited distribution.

An investigation in the S. Tasmanian concession of the Australian Newsprint Mills Ltd., describing the vegetation and successions, and the soils and climate of the area (chiefly temperate rain forest, mixed forest, and *Eucalyptus* forest), the flowering and seeding of *E. regnans*, and sowing trials with that species. Germination and survival were generally best on mineral soil, and poorest on unburnt slash. No seedlings survived under a residual understorey and few in small gaps. It was necessary to treat the seed with an insecticide (dusting with DDT being best) and to fence against browsing damage by marsupials. The problems of obtaining suitable conditions for regeneration, particularly where the understorey has little commercial value, are discussed and recommendations made. If natural regeneration is not obtained within 2–3 years after logging, sowing or planting should be undertaken without delay, as weed growth would make this impracticable later.

2. SILVICULTURE

See also Nos. 1, 317, 869.

321. GOSLING, SIR A. **The influence of ecology on forestry practice.** *Trans. Bot. Soc. Edinb.* 38, 1959 (64–70). 13 refs. O.B.D.

A brief review of ecological studies in Britain, and their influence on the work of the Forestry Commission.

322. MACDONALD, J. **Conifers—South African methods of cultivation, by W. E. Hiley, C.B.E. A review.** *Emp. For. Rev.* 38 (3), 1959 (255–8). [Cf. *F.A.* 20 No. 4353.]

323. HORTON, K. W. **Characteristics of subalpine Spruce in Alberta.** *Tech. Note For. Br. Can.* No. 76, 1959. pp. 20. 32 refs.

The Spruce forests of the Alberta Rocky Mountain region are examined as to taxonomy, ecology and silviculture. Introgressive hybridization apparently exists, with White Spruce occupying lower elevations, Engelmann upper, and a hybrid swarm (intermediate) between. A method of assessing the degree of hybridity of any sample is shown—an index based on cone morphology. Typical and intermediate Spruce types are compared by standardized samples and are shown to be generally similar in such points as age structure and growth. Differences include a higher incidence of Fir and scarcer Spruce reproduction in the Engelmann stands. Ecological and silvicultural highlights of the Spruce-Fir type in general are reviewed. In structure, 75% of stands are thought to be largely even-aged; for these, some form of clear cutting is considered most suitable. Uneven-aged stands are best suited to the single-tree selection system, on which references are given. Spruce natural reproduction is shown to be inadequate in most undisturbed stands; the advantages of scarification as a remedy are discussed in brief. The emphasis is on treating each stand according to its individual characteristics, avoiding generalization. *Author's summary.*

324. MARQUIS, R. W. [Editor]. **What's known about managing Eastern White Pine [*Pinus strobus*].** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 121, 1959. pp. [3] + 69. 81 refs.

A joint publication by members of the Experiment Station's staff, summarizing information on markets and products, volume growth and quality, the effect of site and stocking on quality and reproduction, control of insects and diseases, establishment, tending, thinning, harvesting etc.

325. STRACEY, P. D. **The silviculture and management of tropical rain-forests in India.** *Indian For.* 85 (7), 1959 (385–407). 27 refs.

Reviews the distribution and features of these forests, their silviculture and management in different parts of India, advocating caution in any efforts at intensive working or excessive favouring of selected species.

22. Silvicultural Systems. Constitution and Composition of Stands; Forms of Stand

221. High Forest Systems

See also Nos. 38, 487.

326. STEGARU, M. Contribuţii la studiul creşterilor de lumină in arboretele de gorun parcurse cu prime tăiere de regenerare. **[Light-increment in *Quercus sessiliflora* stands after a first regeneration felling.]** *Rev. Pădurilor* 74 (7), 1959 (388–92). 9 refs. [Rum.russ.g.f.e.]

A regeneration felling that removed ⅓ of the stand produced an absolute increase in increment (2·3 cu. m./ha. in 2 years) due to increased illumination. A felling that removed only ⅓, on the other hand, produced no increase. The experiment showed that *Q. sessiliflora* is able to respond to increased illumination up to an advanced age (> 150 years).

327. WALDRON, R. M. **Experimental cutting in a mixedwood stand in Saskatchewan, 1924.** *Tech. Note For. Br. Can.* No. 74, 1959. pp. 14. 4 refs.

In 1924 the Forestry Branch carried out diameter-limit, seed-tree and strip cuttings in a mixedwood stand on the Pasquia Hills, Sask. Periodic examinations of growth and reproduction plots were made between 1925 and 1956. The most important finding is that the White Spruce component of the new stands created by the various cutting methods will probably equal or surpass that of the original stands. This apparently was the result of an exceptionally heavy White Spruce seed-year in 1924, which also tended to mask differences between cutting methods. However, there appeared to be some relationship between the amount of White Spruce replaced in the stands by 1956 and the residual basal area of all species. The optimum b.a. was ca. 75 sq. ft./acre. Balsam Fir was abundant in the seedling class but did not develop, apparently because of intensive browsing. The Poplars have disappeared. White Birch was well but variably represented; its level of replacement

appears to have been inversely related to the b.a. of all species after treatment. It seems that most of the new stands on the treated compartments will become as well stocked as the original ones. *From author's summary.*

328. OBATA, S. **[Studies on the improvement of firewood species. I. Investigations of the growth of evergreen *Quercus* and *Castanopsis* in test plots.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 106, 1958 (91–177 + 6 plates). 5 refs. [Jap.e.]

An evaluation in 1955 of trials established in 1939 in 25-year-old mixed forests in Nagasaki prefecture, where evergreen Oaks, which formed the greater part of the valuable charcoal species, were increasingly suppressed, chiefly to the benefit of *Castanopsis cuspidata*, as a result of clear cutting on short rotations. Of the two plots selectively cut (to 18 and 12 cu.m./ha. respectively from an original 174 and 193) both, but particularly the heavily cut, in which most of the remaining trees were Oaks, improved in composition and structure over the clear-felled and the untouched controls. They also had the highest increments. The clear-felled plot had the lowest increment, but maintained the species ratios, while the Oaks on the controls had very little increment and lost ground. *From author's summary.*

329. SABROE, A. S. Plenterwaldartige Behandlung in gemischten Laubwäldern. **[Selection type treatment in mixed broadleaved forests.]** *Forstarchiv* 30 (7), 1959 (125–30). 15 refs. [G.]

A shortened version in German of an article in Danish, already noticed [see *F.A.* 20 No. 4239], summarizing the results and supplemented by measurements for 1958.

222. Coppice, Pollarding and Lopping Systems

See Nos. 331–4.

226. Changes of Silvicultural System. Conversion (by System or Species)

See also Nos. 374, 461.

330. TURNER, G. Note relative à la transformation des pessières en station. **[Note on the conversion of Spruce stands.]** *Bull. Soc. For. Belg.* 66 (8/9), 1959 (414–20). [F.]

Describes a method of converting even-aged pure Spruce stands to uneven-aged mixed stands, using a system of group regeneration.

331. PONCELET, J. Sylviculture intensive pour nos besoins en pâte à papier. **[Intensive forestry to meet our pulp needs.]** *Bull. Soc. For. Belg.* 66 (7), 1959 (380–90). [F.]

Mainly discusses the possible conversion of unremunerative coppice to mixed pulpwood stands, by judicious planting of conifers.

332. NOIRFALISE, A., and THILL, A. Les chênaies de l'Ardenne centrale. **[The Oak forests of the central Ardennes.]** *Bull. Inst. Agron. Gembloux* 26 (4), 1958 (362–76). 13 refs. [F.] E.M.B.

These forests, occupying considerable areas of public and private land, have been traditionally treated as coppice for the production of bark and fuel, frequently combined with agricultural cropping or grazing. In consequence they are now very degraded. The following kinds of *Quercus sessiliflora* forest are described: (1) on plateaux and gentle slopes, (2) on lithosols and steep slopes, and (3) on hydromorphic soils. *Q. robur* occurs only on a few sites on the higher plateaux. The effects of past agricultural practices on the present vegetation are described. The following suggestions are made for their conversion to high forest. (1) In some types, pure Beech forest should be established, and in others, Beech with an increasing proportion of *Q. sessiliflora*. On the richer soils a wider choice may be made of mixed hardwoods and conifers. (2) *Q. sessiliflora* should be established in mixture with Beech. Some deeper rooted species, e.g. *Larix decidua, Pinus sylvestris* and *Q. borealis* may also be introduced. (3) These sites are traditionally reserved for *Picea abies*. On the lower plateaux, group mixtures may be made with *Thuja plicata* and *Picea sitchensis*.

333. COCHET, P., and TURPIN, P. Le taillis sous futaie. Les diverses méthodes de conversion. **[Coppice with standards: the different methods of conversion.]** *For. France* No. 89, 1959 (6–10). [F.] X.

Describes the different méthods of conversion to uniform even-aged high forest or to selection forest of mixed hardwoods, and also conversion to conifers (pure or in mixture).

334. MILETIĆ, Ž. Jedan novi metod prevođenja (konverzije) izdanačkih šuma u visoke. **[A new method of converting coppice to high forest.]** *Šumarstvo* 11 (7/8), 1958 (400–8). 5 refs. [Serb.e.f.]

Surveys classical French methods and commends Dakov's new method [see *F.A.* 20 No. 3004].

228. Constitution and Composition of Stands; Choice of Species and Form of Mixture; Tree Classes; Forms of Stand

See also No. 21.

335. SMITH, I. Blandingsbevoksninger af bøg og lærk. **[Mixed plantations of Beech and Larch.]** *Dansk Skovforen. Tidsskr.* 44 (8), 1959 (445–71). 15 refs. [Dan.]

Discusses biological, technical and economic aspects of plantations where (1) Larch is planted in existing Beech stands, (2) there are even-aged mixtures of the species, and (3) Larch is used as a nurse crop, citing Danish examples.

336. VLASEV, V. Rastež na elata, smărča i buka v smesenite srednovăzrastni nasaždenija na UOGS 'G. St. Avramov'. **[Growth of Silver Fir, Spruce and Beech in mixed, medium-aged stands at the 'G. St. Avramov' University and Experimental Forest.]** *Nauč. Trud. Lesoteh. Inst., Sofia* No. 6, 1958 (9–26). 6 refs. [Bulg.g.]

Tabulates and analyses data on the mean and maximum diameters and heights from 18 sample plots in untended 20–30 and 50– to 60-year-old stands of Fir, Spruce and Beech in different proportions. The author recommends that where there is a

marked predominance of Beech on the one hand, or of the conifers on the other, tending should aim at encouraging a better balance, with special attention to the retention and release of promising groups of the species needing assistance.

337. MIHAJLOV, I. Proučuvanje vrz strukturnite elementi na crn-borovite kulturi vo šumata 'Krušino' do gr. Kičevo. [**The structure of *Pinus nigra* plantations in Krušino forest near Kičevo, Macedonia.**] *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje (Šum.)* No. 11, 1957/1958 (43–72). 19 refs. [Maced. g.]

Gives results of an enumeration of 48·91 ha. of 25- to 30-year pure and mixed *P. nigra* plantations. As stocking is low, only light thinnings are advised. Oak and other species should be introduced as a second storey into the pure stands.

338. MIHAJLOV, I. Proučuvanja vrz rastežot i prirastot na steblata od crn-borovite kulturi vo fakultetskata šuma 'Krušino' (do gr. Kičevo). [**Total growth and current increment in the *Pinus nigra* plantations in the Krušino faculty forest, near Kičevo.**] *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje (Šum.)* No. 11, 1957/1958 (73–97). 12 refs. [Maced.g.]

Twenty-five stems from 28-year plantations in Macedonia were felled and analysed, and data on height, diam., b.a. and volume, showing both total growth and c.a.i. by diam. classes over 5-year periods from 0 to 28 years are given in tables and graphs. A check made by taking increment cores and determining increment by 1-m. sections on 172 (felled) trees, confirmed the results.

339. GOGUŠEVSKI, M. Komparativno proučuvanje na taksacionite elementi kaj beliot i crniot bor vo kulturite na 'Krušino' kaj Kičevo. [**A comparative study of enumeration data for *Pinus sylvestris* and *P. nigra* in plantations at Krušino, near Kičevo.**] *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje (Šum.)* No. 11, 1957/1958 (99–129). 17 refs. [Maced.g.*g.*]

Gives figures for stand density, d.b.h., b.a., volume, and c.a.i. on 3 sample plots, each of ca. 0·3 ha., in ca. 30-year stands (one of *P. sylvestris* and 2 of *P. nigra*). On the evidence obtained, the author recommends greater use of *P. sylvestris* in afforestation and its introduction into broadleaved forests in Macedonia, more especially for the more mountainous regions of the Beech belt but also on moist sites on N., N.W. and N.E. aspects in the higher part of the Oak belt.

340. LANIER, L. Forêts artificielles en moyenne Côte-d'Ivoire. [**Forest plantations in the central Ivory Coast.**] *Rev. for. franç.* 11 (8/9), 1959 (592–604 + 2 photos). [F.]

An account of the region, methods of establishment, and silvicultural treatment of Teak plantations (2275 ha.).

341. BABA, K. [**The composition and growth of a prevalent second-growth stand of Birch on burnt-over land in Okoppe district.**] *Extr.* from *Ann. Rep. For. Exp. Sta., Hokkaido 1957*, 1959 (27–39). 3 refs. [Jap. jap. e. *e.*]

Data from 10 plots in stands predominantly of Birch at 160–280 m. altitude include species composition, stem numbers, stand volume, and mean diam. and height, and m.a.i. of the Birch. [Cf. *F.A.* 18 No. 1990.]

23. Regeneration and Formation of Stands

231. Natural Regeneration

See also Nos. 212, 257, 269, 320, 327, 372, 456, 462, 665, 667.

342. ANDRÉN, T.; HALLANDER, Å. Skogens förnyelseproblem I. Skogsbrukets möjligheter att avverka och föryngra den med hänsyn till ungskogsbristen nödvändiga årliga föryngringsytan. II. Södra Sverige. [**The regeneration problem. I. Is it possible to cut and regenerate the areas which should be regenerated in view of the deficiencies of the youngest age classes? II. Southern Sweden [with discussion].**] *Svenska SkogsvFören. Tidskr.* 57 (2), 1959 (215–64). [Sw.]

Lectures and discussion, dealing especially with problems of marketing wood from increased fellings and of seed and plant supply, but also with labour, mechanization, small owners' problems, natural regeneration, etc.

343. IACOVLEV, A. Regenerarea naturală a bradului din reservația I.C.E.S. Mihăești-Muscel. [**Natural regeneration of Silver Fir in the Mihăești-Muscel forest reserve.**] *An. Inst. Cerc. Silv., Bucureşti (Ser. I)* 19, 1958 (69–89). 13 refs. [Rum.russ.f.]

A detailed study was made of abundant natural regeneration of *Abies alba* outside its natural range, at ca. 400 m. alt. It was found that height growth is progressive after the 12th year, which corresponds to the beginning of whorl formation. Height increment increases with increasing illumination, and illumination $< 60\%$ of that in the open is insufficient to ensure the development of young plants. Soil acidity hinders growth, and a pH $< 4{\cdot}9$ prevents it altogether.

344. JACKSON, L. W. R. **Relation of Pine forest overstorey opening diameter to growth of Pine reproduction.** *Ecology* 40 (3), 1959 (478–80). 3 refs.

During winter 1951–52, an experiment was established in Clarke County, Georgia, on the survival and growth of *Pinus echinata* and *P. taeda* 1-year nursery seedlings transplanted at 2 × 2 ft. into overstorey openings ranging from 5 to 55 ft. in diameter, in six 10-ft. classes, and kept weeded for 3 years. After 6 years, mean survival of both species varied from 12 to 31% under the 5- to 25-ft. openings, compared with 46 to 59% under the 35- to 55-ft. openings. During the first 5 years, mean height growth, number of branches per seedling, and mean length of retention of needles, all increased in proportion to increasing diam. of openings. Diameter m.a.i. for *P. echinata* was 5·6–10·5 mm. for the smaller and 18·4 and 24·8 mm. for the larger openings; for *P. taeda* the figures were 9·2–14·4, 21·8 and 35·9 mm. respectively. Results are graphed.

345. LOTTI, T., and LEGRANDE, W. P. **Loblolly Pine seed production and seedling crops in the lower**

coastal plain of South Carolina. *J. For.* 57 (8), 1959 (580–1). 2 refs.

Compares seedfall and the number of seedlings on quadrats unprotected and protected from birds and rodents in two 50-year-old stands, one with no special site preparation, the other with annual summer prescribed burns, for the years 1952–56. From this it appears that many stands in the area could probably be regenerated adequately without leaving seed-trees, if felled after seedfall.

346. GREENE, J. T., and REINES, M. **Reproduction of Longleaf Pine outside its natural range.** *Tree Plant. Notes* No. 35, 1959 (26–7). 5 refs.

Records natural regeneration of *Pinus palustris* in a plantation at Athens, Ga., ca. 60 miles N.W. of the nearest natural limits of the species.

347. HOU, C.-P. **[Site conditions and the regeneration of Larch in the Changpai Shan Mts. [N.E. China].]** *For. Sci., Peking* No. 4, 1959 (261–78 + 1 tbl.). [Chin.russ.]

The area is divided into 4 forest zones, and also into 3 broad types on the basis of soil moisture, viz. bogs with water stagnant for a long time (4 site types), ditto for a short time (5 site types), and soils not influenced by groundwater (7 site types). Eight types of *Laricetum* are defined. Natural regeneration of Larch is generally not satisfactory except on the *L. lespediosum* and *L. hylocomiosum*, and therefore should be attempted only on these, planting being done elsewhere. Recommendations are made on planting techniques.

348. BIRAUD, J. Reconstitution naturelle et amélioration des peuplements d'okoumé du Gabon. **[Natural regeneration and improvement of *Aucoumea klaineana* stands in Gabon.]** *Bois For. Trop.* No. 66, 1959 (3–28). [F.e.span.]

A study of existing stands indicates that clearing of the forest by man has been the main factor in invasion by *A. klaineana* (a light-demander), colonization of savanna and of gaps caused by windthrow being less important. Natural regeneration of this species demands, besides the presence of seedbearers, gaps in the forest of $< \frac{1}{4}$ ha. and a bare forest floor. Recommended treatment of existing pure stands is thinning to a density of 70 or 80 trees per ha. with diameters of 30–40 cm. Suppressed and subdominant Okoumé should be removed, as well as miscellaneous species that hamper growth of the selected trees, but it is important to leave an understorey of miscellaneous species to grow together with the Okoumé. Experiments are in progress on direct sowing on cultivated ground.

232. Artificial Regeneration

See also Nos. 342, 462.

349. SURI, P. N., and SETH, S. K. **Tree planting practices in temperate Asia: Burma—India—Pakistan.** *FAO For. Developm. Pap.* No. 14, 1959. pp. x + 150. 42 refs.

A companion volume to No. 10 (Japan) [cf. *F.A.* 17 No. 3809]. Covers collection, handling and treatment of seed, nurseries and nursery practice, planting methods, protection, afforestation for erosion control; and includes more or less detailed notes on important species.

350. ALEXANDER, J. A. **Eucalypt plantation establishment in Victoria [with discussion].** *APPITA, Melbourne* 13 (1), 1959 (5–10).

Reviews the need for, and problems of, the establishment of *Eucalyptus* plantations in Victoria. Details are given of the nursery and planting techniques used by the Australian Paper Manufacturers Ltd., which raises both tubed and open-rooted seedlings and usually employs machine planting. The necessary steps in plantation establishment, especially the control of vermin, are outlined, and the possibilities of direct sowing and of enrichment planting, including the use of wilding stock, are discussed. Results since 1953 have been variable, but, particularly with *E. regnans*, very encouraging.

351. SOLJANIK, I. Ogledi razmnožavanja srebrolisnog javora i crvenog hrasta kod nas. **[Experiments in propagating *Acer saccharinum* and *Quercus borealis* in Jugoslavia.]** *Šumarstvo* 11 (7/8), 1958 (438–43). 11 refs. [Serb.e.f.]

Both planting and direct sowing of these species on experimental plots in 5 climatically different regions of Serbia from 1947 gave good results, and as they have dense foliage, which quickly forms a thick mull, they are recommended for afforesting denuded areas or improving degraded forest.

232.1. Choice and Trial of Species, Races etc.

See also Nos. 21, 461, 497–8, 1279.

232.11. Species Trials, including Forest Gardens, Trials of Exotics etc.

See also Nos. 155, 340.

352. DOBROVOL'SKIJ, I. A. Kul'tura *Metasequoia glyptostroboides* Hu et Cheng v stepnoj časti Ukrainskoj SSR. **[The cultivation of *M. glyptostroboides* in the steppe region of the Ukraine.]** *Bot. Ž.* 44 (2), 1959 (199–202). 7 refs. [Russ.]

Three 2-year seedlings of *M. glyptostroboides* were planted out in early May 1955 under the shade of other trees, and watered and tended regularly. Mean height increment in 1955 was 9·3 cm., and the seedlings withstood winter temperatures of −24° C. and late frosts of − 5°. In 1956, height increment averaged 20·3 cm. Phenological and climatic data are given. The species appears able to withstand the conditions of the Ukraine steppe region, but needs a moist soil and is sensitive to deficiency of soil water, especially in youth.

353. RADULOVIĆ, S., and PEJOVIĆ, D. Još jedan prilog proučavanju razvoja crnog bora na Avali na stanistu *Querceto-Carpinetum serbicum.* **[Further notes on the development of *Pinus nigra* on a *Quercetum-Carpinetum serbicum* site on Mt. Avala.]** *Šumarstvo* 12 (3/4), 1959 (105–16). 3 refs. [Serb.f.]

[Cf. *F.A.* 19 No. 4053.] Eight stems, 6 from pure plantations and 2 from mixed stands, were felled and analysed; in addition, 58 increment cores were

taken from the pure stand. Rates of growth in d.b.h., height, and volume between the ages of 5 and 52 years are shown, and the favourable effect of the thinnings on diam. and volume c.a.i., particularly in the last two years, is clearly demonstrated. The influence of climatic factors on growth is also discussed.

354. MATSUI, Z., and INOUE, M. **[The classification and ecological study of soft Pine, and its species planted in Hokkaido.]** *Extr.* from *Ann. Rep. For. Exp. Sta., Hokkaido 1957*, 1959 (17–26). 13 refs. [Jap.jap.e.]

Classifies and discusses briefly the distribution of 28 soft Pine species and discusses the distribution in Japan of *Pinus pentaphylla, P. parviflora, P. koraiensis, P. pumila, P. parapumila, P. hakkodensis* and *P. amamiana*. Form varies with species and locality. Average heights and leaf lengths of Japanese species are: *P. koraiensis* 30–35 m., 10 cm.; *P. pentaphylla* 20–30 m., 7–8 cm.; *P. parviflora* 20–24 m., 5–6 cm.; and *P. pumila* 2–5 m., 2–4 cm. Bark thickness may be related to resistance to White Pine blister rust; the thick-barked Japanese species *P. koraiensis* and *P. parviflora* may prove more resistant than *P. strobus*. Cone and seed form and propagation by layering are discussed. The vegetation type, intermediate between Spruce/Fir and Beech, where *P. pentaphylla* occurs, is recommended for the introduction of soft Pines in Hokkaido. Species expected to do well in Japan are *P. strobus, P. koraiensis, P. monticola, P. lambertiana, P. excelsa* and *P. peuce*, and in Hokkaido, where cold winters occur, *P. strobus, P. koraiensis* and *P. pentaphylla*, all of which were planted in 1881–1908; mean volume increments of 6·6–12 cu.m., 5–8·4 cu.m., and 4–6·6 cu.m./ha. respectively can be expected. *P. strobus* should be grown on rich, *P. koraiensis* on moist, and *P. pentaphylla* on gravelly soils. *From authors' summary.*

355. WILLISTON, H. L. **Growth of four Southern Pines in West Tennessee.** *J. For.* 57 (9), 1959 (661–2). 4 refs.

A further report on the plantations [see *F.A.* 12 No. 1882] at 29 years. Loblolly, Longleaf, Shortleaf and Slash have respectively 178, 143, 158 and 156 sq. ft. of b.a./acre, the mean height of the dominants is 56, 58, 45 and 62 ft., and the volume 3233, 2906, 2080 and 2683 cu.ft./acre.

356. DELAITE, L. Le chêne rouge d'Amérique en Ardennes. **[*Quercus borealis* in the Ardennes.]** *Ann. Gembl.* 65 (1; 2), 1959 (14–43; 83–99). 11 refs. [F.] A.P.B.

Describes the morphological characteristics of *Q. borealis*, its natural distribution in America, native climate compared with that of Belgium, optimum soil conditions, behaviour on different soils in comparison with native Oaks, and its soil-improving properties. Silvicultural characters, growth habit, stem increment and crown development are also described, with characteristics of diameter growth, and the relative dimensions of bark, sapwood and heartwood. Relative data are provided from Belgian stands. The final sections deal with the growing of *Q. borealis* in the Ardennes, including a discussion of suitable high-forest systems, and with increment and yield, illustrated by figures from some stands in the region.

357. BROWICZ, K. Buki uprawiane w Polsce. **[Beeches grown in Poland.]** *Roczn. Dendrol. Polsk. Tow. Bot., Warsz.* 13, 1959 (67–93). 37 refs. [Pol.e.]

Describes 7 species of *Fagus*, and 20 varieties of *F. sylvatica*, found in Poland (mainly in arboreta), recommending some of the species and varieties for use on a large scale in Poland, some as decorative, some as forest trees. [Cf. *F.A.* 21 No. 507.]

358. ŠIKA, A. Růstové vlastnosti ořešáku černého v mládí. **[Growth details of young plants of *Juglans nigra*.]** *Věd. Práce Výzkum. Úst. Lesa Mysl., Praha* No. 2, 1958 (61–79). 27 refs. [Cz. russ.g.]

[Cf. *F.A.* 19 No. 3949.] In order to ascertain the growth characteristics of young plants in Czechoslovakia, the species was studied during the growing season (from the beginning of May to the end of August) for the first 3 years on two trial plots in Strnady. Maximum heights of 180 by the second, and 400 cm. by the fourth year were attained, the necessary conditions for this being deep, moist soil of good physical structure, careful tending in the first two years, and plenty of light. Maximum growth occurs, under normal climatic conditions, in June, variations being observed for stands in other parts of the country, e.g. July–August in Moravia.

359. DJEKOV, S. *Populus virginiana* Foug. vo Skopje i negovata okolina. Dendrološka i dendrometrijska karakteristika. **[*P. virginiana* in Skopje and its vicinity. Dendrological and mensurational notes.]** *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 11, 1957/1958 (5–27). 8 refs. [Maced.g.g.]

Reports on a study of a ♀ clone ('*P. virginiana*') of *P. deltoides* cultivated in parks in Skopje and its vicinity, with observations on phenology (especially flushing date), germinative capacity of seed (which, being the result of open pollination by other Black Poplars, produced a wide range of hybrid seedlings), propagation by cuttings, and increment in height and diameter. The clone appears to be worth planting on a larger scale in this region.

360. FELDMAN, N. El *Eucalyptus gomphocephala* con referencia a su comportamiento en zonas áridas en particular de Israel. **[*E. gomphocephala* with reference to its behaviour in arid zones, particularly those of Israel.]** *Rev. for. argent.* 3 (2), 1959 (35–8). [Span.]

Presents information on silvicultural characters, properties of the wood, and behaviour and development of the tree in different parts of Israel. *E. gomphocephala* has an advantage over *E. rostrata* in that it is more adaptable to calcareous soils and is more windfirm.

361. BORGO, G. Resumen de la conferencia 'Notas preliminares sobre la introducción experimental del género *Eucalyptus* a la Huasteca Potosina'. **[A summary of the lecture 'Preliminary notes on the experimental introduction of *Eucalyptus***

spp. to Huasteca Potosina' [Mexico].] *Mensajero for., Durango* 17 (171), 1958 (7, 25–6). [Span.]

The trial covered 57 *Eucalyptus* spp. at spacings of 2 to 3·6 m. After 2 years, the most promising were *E. umbellata*, *E. saligna*, *E. paniculata*, *E. botryoides*, *E. rudis*, *E. trabuti* and *E. algeriensis*, with a mean annual d.b.h. increment of 2–3·6 cm. The probable profitability of plantations of Eucalypts in Mexico is discussed.

362. ARDIKOESOEMA [ARDIKUSUMA], R. I., and SADAN WIDARMANA. Pertjobaan tanaman *Acacia catechu* di Djawa. **[Planting experiments with *A. catechu* in Java.]** *Commun. For. Res. Inst., Bogor* No. 65, 1959. pp. 40. 19 refs. [Jav.e.]

Experiments in Java have so far given promising results in all types of climate and at altitudes from 0 to 300 m. Properties and uses of the wood are discussed. Trees start to bear seed at 3 years. Germination is high (80%), and there are ca. 11,000 seeds per litre and 15,493 per kg. Direct sowing is suitable for wet districts, or transplanting can be in Bamboo tubes to reduce competition from weeds and to increase resistance to drought. Rats and porcupines gnawing the root and bark of young plants are the chief enemies of *A. catechu*. On stony waste ground it grows faster than Mahogany, the usual substitute for Teak on poor sites. Plantations on a semi-industrial scale in the forest districts Bondowoso and Jogjakarta will be studied for fuelwood production and tannin content. *From authors' summary.*

232.12. Races and Provenance Trials

See also Nos. 113, 116, 195, 381.

363. AUSTIN, T. Retningslinjer om valg av treslag og provenienser på Vestlandet: nytt system for betegnelse av utenlandske provenienser. **[Guide to the choice of species and provenances for W. Norway: a new system for designating foreign provenances.]** *Norsk Skogbr.* 4 (7), 1959 (193–5). [Nor.]

Reviews a publication of the Norwegian Seed Commission on species and provenances and includes two maps, one of Europe and one of N.W. America, showing the chief seed districts and their code letters (the first 3 letters of the name of the district or of an important town in it).

364. KOCIĘCKI, S. Porównanie dwóch upraw doświadczalnych modrzewia polskiego założonych w Czechosłowacji i w Polsce. **[Comparison of two experimental plantations of Polish Larch established in Czechoslovakia and Poland.]** *Sylwan* 103 (6/7), 1959 (39–44). [Pol.russ.e.]

Results in Poland were similar to those in Czechoslovakia [see *F.A.* 20 No. 373]. The Skarzysko provenance had the best form and height increment, and the Mala Wies provenance the best diameter increment. Survival was better in Poland than in Czechoslovakia.

365. ŠTASTNÝ, T. Az 1909–1912-ben létesített erdeifenyö származási kísérletek értéklése Likavkáról. **[Evaluation of the international Scots Pine provenance trials started in 1909–12 near Likavka.]** *Erdész. Kutatás., Budapest* 1958 (3/4), (68–103). 32 refs. [Hu.russ.e.g.*russ.g.*]

As part of an international provenance trial [cf. Petrini, *F.A.* 5 p. 165], plots of Pine from seed from Scotland, France, Prussia (2 provenances), Belgium, the Rhineland, Latvia, the Urals, Bulgaria, Slovakia (2) and Holland were established in 1909–12 at Likavka near Rózsahegy [now Ružomberok, Czechoslovakia]. The trial area is: 49° 6′ N., 19° 17′ E., 560 m. alt., E. aspect, slope 20°. Stand data on the height, diameter, b.a., volume, stem form, crown form, and branching habit are tabulated from both 1951 and 1957, and data from another trial in the same area, comprising 2 Jugoslavian and 5 Slovakian provenances, are also taken into account. The growth at Likavka is compared with that in the other provenance plots at Chorin, Raunheim and Hassleby. At Likavka, volume production of the Dutch, Scottish, French and Rhineland provenances was < 30% of that of the native Hyby provenance. The difference in volume production between Pines of the oceanic types and the boreal type was significant; between the oceanic and the continental type highly significant; but between the boreal and the continental type it was not statistically significant.

366. CALLAHAM, R. Z., and METCALF, W. **Altitudinal races of *Pinus ponderosa* confirmed.** *J. For.* 57 (7), 1959 (500–2). 3 refs.

A further report on the problem [cf. *F.A.* 14 No. 2128]. Seed of *P. ponderosa* and *P. jeffreyi* was sown in 1937, and the 2-year stock planted out on a North Coast site at 1830 ft. alt. The *P. ponderosa* seed was from 7 elevation zones (500–6500 ft.), the *P. jeffreyi* from 5 (3500–8500 ft.). The results confirm the earlier report on the performance of the same seed lots in the Sierra Nevada. Trees from high elevations, with one notable exception (*P. jeffreyi* from 8235 ft.), tended to grow more slowly than trees from low elevations. The large-seeded *P. jeffreyi* tended to grow more slowly at first than the smaller-seeded *P. ponderosa*. The latter, irrespective of altitudinal provenance, did not produce a typical dormant resting bud at the end of the first growing season, while *P. jeffreyi* showed a greater propensity for bud development.

367. WOERHEIDE, J. D. **Loblolly seed from Maryland best of six sources tested in southern Illinois.** *Sta. Note Cent. St. For. Exp. Sta.* No. 129, 1959. pp. 2. 1 ref.

[Cf. *F.A.* 13 No. 3748.] After 10 years, trees from Maryland seed showed best survival and growth, with a mean diam. of 4·1 in., mean height of 25 ft., and b.a. of 106 sq. ft./acre. Trees from Virginia seed gave the next best results, and on both of these plots the Pines tended to suppress hardwood brush competition. The b.a. of the 3 southernmost sources—Mississippi, N. and S. Carolina—was only 65–75% of that of the Maryland stands.

368. STREHLKE, E. G. Auf die Herkunft kommt es an! Zum Anbau der Douglasie in Deutschland. **[The importance of provenance. The planting of Douglas Fir in Germany.]** *Forst- u. Holzw.* 14 (14), 1959 (289–95). 7 refs. [G.g.]

Discusses experience in Westerhof forest district

(W. of the Harz) with Douglas Fir, aged 103, 59, 21–22, and ≤ 9 years in 1959, all from unknown or indefinite provenances. The growth rate of Douglas Fir compares favourably with that of Spruce. Analysis of pruning costs shows a net profit of DM.0.25/stem when the branches are sold as decorative foliage. The value and uses of the wood and its future prospects are reviewed. The distribution of Douglas Fir in N. America, its forms (*viridis*, *glauca* and *caesia*), and information from provenance trials are discussed with a view to determining the best provenances to supply seed for use in Germany. Thirty stands in N. America selected by the author for more provenance trials are mapped. [Cf. *F.A.* 21 No. 381.]

232.13. Trials of Hybrids and Other Products of Tree Breeding

See also section 165.

369. LARA, L. F. DE SOUSA. Elementos de estudo para conhecimento de alguns 'clones' de choupo. **[Preliminary studies of some Poplar clones.]** *Estud. Inform. Serv. Flor. Aqüic. Portugal* No. 108–*A*3, 1959. pp. 5 + 20 tbls. + 3 gphs. + 1 dgm. [Port.] Limited distribution.

Gives the results of a preliminary study of the development of 10 different clones, mainly hybrid Black Poplars, in the nursery over the first 6 months. Height and diameter measurements of 50 individuals are presented, along with climatic data. The plants were watered weekly.

232.2. Preparatory Work. Auxiliary Measures

See also Nos. 449–50, 456, 478.

370. JONES, E. P. **Wet site survival and growth.** *Res. Note Stheast. For. Exp. Sta.* No. 130, 1959. pp. 2. 2 refs.

In order to compare survival and growth of *Pinus elliottii*, *P. taeda*, *Liriodendron tulipifera* and *Populus deltoides* on low, wet sites, test plantings were made on two types of plot: (*a*) cultivated, i.e. burned and disked to field conditions, and also cultivated in the first growing season; and (*b*) uncultivated, i.e. burned, and shrubby undergrowth removed. After the first growing season, survival of *P. deltoides* on (*a*) was 45 and on (*b*) 71·4%; for the other three species survival ranged from 62·5 to 81·6 on (*a*) and 59·8 to 87·8% on (*b*). At 4 years of age, survival %s were: (*a*) *P. elliottii* 80·2; *P. taeda* 82·9; *L. tulipifera* 25·9; *P. deltoides* 0%; and (*b*) 82·3; 80·9; 40·1; 0%. The complete failure of *P. deltoides* may be due to competing vegetation or inadequate rooting of the cuttings. While site preparation had little effect on Pine survival, the mean height for (*a*) was more than double that for (*b*) at 4 years. Survival and height growth of *L. tulipifera* were greater for (*b*) than for (*a*) [cf. *F.A.* 19 No. 310]. After 4 years the mean height of *P. elliottii* was 28% greater than that of *P. taeda* on (*a*) and 9% greater on (*b*), but this disparity may be due to *Rhyacionia frustrana*, which attacked 99% of the *P. taeda* on (*a*) vs. 79% on (*b*). No other insect damage or disease was found in significant amount.

371. MITCHELL, B. A. **Site preparation by manual and mechanical means on degraded lands in Malaya.** *Malay. Forester* 22 (3), 1959 (226–37 + 4 photos). 6 refs.

The results and conclusions of some trials in mechanical and manual clearance of *Imperata cylindrica* grassland, *Gleichenia linearis* thickets, and low scrub, before and after planting, which were carried out between 1953 and 1958, are presented. Costs and time taken in tractor- and man-hours are given, and the observed effects on the planted trees noted. Conclusions are that complete clearance is rarely effective, but that partial clearance may be practicable, provided that the value of the timber grown is commensurate with the cost of the work. The shortage of indigenous cabinet-wood timber trees in Malaya gives an impetus to planting exotics of this type at somewhat greater expense than would normally be countenanced for reforestation. Two of the major hazards in reforestation work in Malaya are competition from low herbaceous and woody growth, and fire damage. Since the competing vegetation, rather than the planted trees, provides the fire danger, two birds can be killed with one stone by regulating or removing it. Experiments have been carried out, principally since 1953, using both manual and mechanical means of clearing. Work on the mechanical side was stepped up following the purchase by the Forest Research Institute of equipment to cultivate and maintain fire lines. This same equipment has been employed to assist the planted trees, by cultivation before and after planting. *From author's summary.*

372. LEVANTO, S. Metsämaan laikutuskokeita hevos- ja traktori-vetoisilla laikkureilla. **[Experiments in scarifying forest soil with horse- and tractor-drawn scarifiers.]** *Julkaisu, Työtehoseura, Helsinki* No. 83, 1959. pp. 76. 11 refs. [Fi.e.]

Presents results of time studies and measurements on depth, area and spacing of scarifications done by 24 horse- or tractor-drawn scarifiers and 7 experimental hand scarifiers, driven by power saw [illustrated]. The horse-drawn scarifiers were successful with humus layers < 6 cm. deep; mean time taken ranged from 1 min. 58 sec. to 2 min. 43 sec. per 100 m. according to soil conditions, and the presence of logging residues considerably affected results. The tractor-driven scarifiers were successful with humus < 8·5 cm. deep, but on light sandy soils the scarifications made were too deep, and horse traction was preferable. On stony soils the normal mean time per 100 m. (2 min. 11 sec. to 3 min. 47 sec.) increased to 4 min. 41 sec. Working time for implements driven by power saw (including moving from place to place) was 5 hr. 23 min.–9 hr. 22 min. per 2500 scarified patches of 20 sq. dm. each. A new light-weight scarifier, intended for use with a horse, but also suitable for tractors, has been designed on the basis of these studies; it is the ORA, manufactured by Oy Oulum Rautateollisuus Ab, Oulu. *From author's summary.*

373. RUDNICKI, J. Od pełnych odkładnic w pługu leśnym do korpusu przesiewnego i uprawy gleby w leśnictwie. **[Using a 'sifter' body with**

modified mouldboards in a forest plough.] *Sylwan* 103 (6/7), 1959 (45–50). [Pol.]

Describes a special strip plough developed by the Polish Forest Research Institute, in which the furrow slices are turned outward by double mouldboards, and the soil in the strip between them is cultivated by two upright metal plates on the slade of the plough below the mouldboards. Quality of work is said to be better than with conventional double-mouldboard strip ploughs.

374. ROOSEN, J. W. Erfahrungen bei der Wiederaufforstung von Fichten-Katastrophenflächen. **[Reforestation of devastated Spruce forests.]** *Allg. Forstzeitschr.* 14 (37), 1959 (660–4) [G.]

Successful methods of establishing mixed plantations in areas in Westphalia devastated by windthrow, barkbeetles, etc., included sowing in drills between previously sown *Waldstaudenroggen* (a type of biennial rye) with or without oats, followed by lupins. Yields of cereals and lupin seed over 5 or 6 years covered all costs, including site preparation, liming, etc., and the method, where feasible, was superior even to soil-block planting [cf. *F.A.* 19 No. 4131].

232.3. Seed, Nursery Practice, Direct Sowing

See also No. 155.

232.31. Seed

See also Nos. 105, 261–74.

375. ENESCU, V. Producerea puieţilor de anin negru din sămînţă. **[The production of *Alnus glutinosa* seedlings.]** *Rev. Pădurilor* 74 (6), 1959 (331–4). [Rum.]

On the basis of the author's experience, gives directions for harvesting, storing and sowing the seed, tending seedbeds etc.

232.311. Seed Production (Seed Years, Seed Crops; Seed Orchards and Methods of Inducing Seed Production)

See also Nos. 113, 131, 345, 433.

376. ROY, D. F. **Small seed traps perform well in the Douglas-Fir type of California.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 150, 1959. pp. 7. 4 refs.

The efficiency of small seed-trays 1 ft. square and constructed of wire gauze and netting, was compared with that of the standard 8·2-sq. ft. wooden traps under Douglas Fir. A statistical analysis of the results showed that, in a year of heavy seed-fall, the small traps performed as well as the standard traps, and the performance was not affected by distance from the seed source. When seed-fall is light, small traps will not sample seed-fall, trap for trap, as accurately as large traps; but 8 of the small traps dispersed throughout an area could be expected to give a more accurate sample than a single standard trap.

377. SCHUBERT, G. S., and BARON, F. J. **California cone crop—1959.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 155, 1959. pp. 6 + 1 map. 3 refs.

Assesses the expected 1959 crop for 13 zones in California from field reports based on ocular estimates. The species assessed were *Libocedrus decurrens*, *Tsuga mertensiana*, *Juniperus occidentalis*, and 2 *Pseudotsuga*, 2 *Sequoia*, 4 *Abies* and 8 *Pinus* species.

378. MÁTYÁS, V. Magyarország magtermelö erdöállományai. **[Stands for seed production in Hungary.]** *Erdész. Kutatás., Budapest* 1958 (3/4), (207–44). 67 refs. [Hu.russ.e.g.*russ.g.*]

Discusses the introductory work done in 1948–58 on forest typology, age-class distribution, seed production, etc. in the 1114 seed stands (Pines 3313, Oaks 2883, Robinia 738, Poplars 68 ha.) demarcated in the 32 Hungarian State Forests,and also with the 2281 individual seed-trees of these species selected throughout the country. These studies are to be extended to other species.

232.312. Seed Collection, Extraction and Grading (including Seed Weight)

379. KARLSSON, I. Klyv kotten, räkna de genomskurna fröna, bedöm fröutbytet. **[Estimate seed yields by cutting the cone and counting the number of seeds cut through.]** *Skogen* 46 (19), 1959 (392–3). [Sw.]

Tests were made on cones from 21 trees from 6 districts of Sweden, altitudes ranging from 60 to 410 m. Cones (at least 25 on each occasion) were collected in Sept. 1958 for cutting and in December for germination trials. A close correlation was found between the number of seeds cut through and number of seeds per cone, irrespective of district or altitude. Germination % was generally 15% higher than the % of full seeds cut through, possibly because the cones for cutting had been collected earlier; however, with material from the higher altitudes, where germination % was lower, the two figures were roughly the same. It is concluded that the method can be used to indicate whether a given area should be used for cone collection or not.

380. ANDRESEN, J. W. **Collecting can for small tree-fruit.** *Tree Plant. Notes* No. 35, 1959 (17–9).

Detailed instructions (with illustrations) for making from sheet aluminium a collecting box fitted with tines and fixed to a pole. The tines sever the fruit from the twigs so that it falls into the box. It is suitable for collecting the small woody or semi-fleshy cones of *Juniperus*, *Tsuga*, *Alnus* and *Chamaecyparis* spp.

381. STREHLKE, B. Die Ernte von Douglasiensamen in USA und Kanada: Folgerungen für die deutsche Forstwirtschaft. **[The Douglas Fir seed harvest in N. America: conclusions for forestry in Germany.]** *Forst- u. Holzw.* 14 (14), 1959 (295–8, 300). [G.]

Describes methods and organization, pointing out the lack of control and the danger that seed may be collected from poor provenances, urging upon European purchasers the necessity of demanding exact information on seed origin. [Cf. *F.A.* 21 No. 368.]

382. OSTROWSKI, H. Hodowla i pozyskanie nasion daglezji zielonej. **[Raising *Pseudotsuga taxifolia* var. *viridis* and collecting its seed.]** *Sylwan* 103 (6/7), 1959 (51–61). 5 refs. [Pol.]

Compares the rate of growth of Quality I Douglas Fir in Germany, England and the U.S.A., and with Quality I Spruce in Germany. Gives data from a 1951 inventory of Douglas Fir > 40 years old in Poland, and discusses cone yields and seed extraction in Poland.

383. LANQUIST, K. B. **Portable automatic cone kiln.** *Tree Plant. Notes* No. 35, 1959 (10–4).

Includes photos and scale plans of the kiln (U.S. Patent No. 2,825,453) invented by the author. It consists of an electrically heated metal box enclosing a tumbling cage for the cones. A time clock on a motor automatically causes the cage to revolve for a desired interval, e.g. 10 min. during each hour. Infra-red bulbs generate heat controlled by a thermostat. The novel patentable feature of the kiln lies in its having double sheet-metal walls ca. 1 in. apart. Since the outer wall is always cooler than the inner one, moisture driven out from the cones condenses on it and runs to the bottom of the box where it drains through holes.

384. DROC, N., VULCAN, G., and MUȚIU, O. Citeva date privind conurile și extragerea semințelor de pini din apropierea Sibiului. **[Some data on the cones of Pines from the neighbourhood of Sibiu and the extraction of seed from them.]** *Rev. Pădurilor* 74 (2), 1959 (84–6). 8 refs. [Rum.russ.g.f.e.]

Gives data on size and weight of cones of *Pinus sylvestris* and *P. nigra*, drying time, and increase in volume of cones in the kiln, and yield of de-winged seed.

385. SWITZER, G. L. **The effect of specific gravity separation on some common indices of Loblolly Pine seed quality.** *J. For.* 57 (7), 1959 (497–9). 6 refs.

A 440-lb. lot of de-winged and cleaned Loblolly seed was processed on a separator (gravity table) with a wire deck, seeds being collected at 6 different gravity-table positions as they passed off the deck. This effected a significant elimination of empty or blind seed. Gravity separation also significantly influenced some of the indices of seed quality, viz. number of seeds/lb., weight of seed/unit volume, and germinative capacity.

386. MARJAI, Z. Magbél és maghéj súlyarány változások erdei- és feketefenyö esetében. **[Variations in the proportion by weight of kernel and seed-coat in the seeds of Scots and Austrian Pine.]** *Erdész. Kutatás., Budapest* 1958 (1/2), (205–13). 11 refs. [Hu.russ.e.g.]

The air-dry weights of the kernel and seed-coat of 22,000 seeds of Austrian and 18,000 seeds of Scots Pine were analysed. The material came from various sites and included samples of high, medium and low 1000-seed-weight. With both species, variations in weight were recorded for both parts of the seed, the kernel having the greater influence. In Scots Pine the seed-coat is $\frac{1}{4}$, in Austrian Pine $\frac{1}{3}$ of the total seed weight. Empty seeds of Scots Pine averaged 0·0038 g. and of Austrian 0·0083 g. In both species, warm sites with light soil gave a higher 1000-seed-weight than cold sites with heavy soil.

387. STILINOVIĆ, S. Uticaj krupnoće i starosti semena na razvitak sadnica amorfe (*Amorpha fruticosa* L.). **[The influence of size and age of seed on seedling development of *A. fruticosa*.]** *Šumarstvo* 11 (7/8), 1958 (474–6). [Serb.]

Tests (1951–54) showed that after 4 years' storage in glass containers at room temperature, *A. fruticosa* seeds retained the ability to develop into good seedlings, seedling development being affected more by seed size than length of storage.

232.314. Seed Purchase, Trade and Transport (including Seed Certification and Legislation for this Purpose)

See also No. 381.

388. **Certification standards for forest tree seed.** *Tree Plant. Notes* No. 35, 1959 (3–9).

Revised standards adopted by the State of Georgia.

232.315. Seed Storage and Treatment

See also Nos. 387, 405, 624.

389. JOHNSEN, T. N., JR. **Longevity of stored Juniper seed.** *Ecology* 40 (3), 1959 (487–8).

Seed of various ages, stored dry in bags or jars, was tested in the greenhouse for germination %. *Juniperus osteosperma*, 45 years old, gave 17% germination; *J. monosperma*, 21 years old, 54%; and *J. deppeana*, 9 years old, 16%.

390. HOSNER, J. F., DICKSON, R. E., and KAHLER, L. **Storing Loblolly Pine seed in polyethylene bags as a substitute for stratification.** *J. For.* 57 (7), 1959 (495–6). 4 refs.

Seed moistened (*a*) in water or (*b*) in fungicide solution (Captan 50 at 2 lb./100 gal. water) was (1) stored at 36–38° F. in polythene bags for 60 and 90 days, or (2) stratified for 60 days in moist sand. No differences in germination were noted between (*a*) and (*b*). There were no statistically significant differences in total germination %, or in the time required to reach 90% of total germination, between (1) and (2). All treatments significantly reduced the time required to reach 90% of total germination as compared with untreated control seed.

391. LJUBČENKO, V. M. Aktivnost' katalazy v semenah *Tilia cordata* Mill. i *Euonymus europaea* L. v processe stratifikacii. **[Catalase activity in the seeds of *T. cordata* and *E. europaeus* during stratification.]** *Bot. Ž.* 44 (4), 1959 (522–4). 10 refs. [Russ.]

Catalase activity, determined separately in the endosperm and embryo of *T. cordata* seeds after (*a*) 240 days' dry storage, and after stratification for (*b*) 120 days at 15° C., (*c*) 240 days at 15°, (*d*) 60 days at 15° and 180 days at 0°, increased in both embryo and endosperm in the order (*a*), (*b*), (*c*), (*d*). In *E. europaeus* seeds it increased in the order: (1) after 240 days' dry storage, and after stratification for (2) 240 days at 0°, (3) 240 days at 15°, (4) 150 days at 15° and 60 days at 0°, (5) 150 days at 15° and 90 days at 0°, (6) as (5) but with seeds previously germinated.

392. GANČEV, A. Esenen posev i stratifikacija na semena ot planinski jasen, javor, i šestil s različna stepen na zrjalost. **[Autumn sowing and stratification of seeds of *Fraxinus excelsior*, *Acer pseudoplatanus* and *A. platanoides* at different stages of ripeness.]** *Izv. Inst. Gorata Bălg. Akad. Nauk., Sofia* No. 2, 1957 (437–50). 8 refs. [Bulg.russ.g.]

Seed gathered at various dates in autumn, was (*a*) sown immediately in the nursery or (*b*) stratified. The temperature conditions of both treatments are given. The germination % of (*a*) and % of seeds of (*b*) ready to germinate by 8 April for each collection date are presented.

393. KRAUS, J. F. **Methoxone treatment of Longleaf Pine seed.** *J. For.* 57 (9), 1959 (650). 1 ref.

Seeds were soaked at room temperature for 24 hours in aqueous solutions of methoxone [cf. *F.A.* 13 No. 3763] and then rinsed and sown. Concentrations of methoxone at > 500 p.p.m. proved toxic to Longleaf Pine seed, and the effect of low concentrations was either too short-lived or did not stimulate the desired acceleration of height growth and early seedling development.

394. RICHARDSON, S. D. **Germination of Douglas-Fir seed as affected by light, temperature and gibberellic acid.** *For. Sci.* 5 (2), 1959 (174–81). 14 refs.

[Cf. *F.A.* 19 No. 4085; 20 No. 2705.] Studies in a controlled environment showed that the germination of non-stratified seed could be accelerated by up to 23 days (50% of max. germination) by exposure to long (16- or 24-hr.) photoperiods at 14 or 20° C., but not at 26°. Total germination, however, was unaffected. Gibberellic acid at 5 p.p.m. accelerated germination by up to 7 days in both light and dark, but did not affect total germination. This confirms that, in germination, gibberellic acid does not act in conjunction with light but as a general germination stimulant. *From author's summary.*

395. ZAAR, È. I. Nekotorye biologičeskie osobennosti prorostkov *Quercus robur* L. **[Some biological peculiarities of young seedlings of *Q. robur*.]** *Bot. Ž.* 44 (5), 1959 (648–51). 10 refs. [Russ.]

Germinating acorns with the seed-coat removed, and with radicles 0·3–0·6 cm. long, were placed in 0·1% aqueous solution of heteroauxin for 10–12 min. and then sown. This treatment retarded growth of the main shoot and caused as many as 3 additional shoots to grow from the axils of the cotyledons. Unlike normal seedlings, these plants also had several roots, corresponding in most cases to the number of shoots. The total height of all the stems on one 2-year-old seedling was equal to that of the stem of a normal 3- to 4-year-old plant. The possible advantages to the silkworm and tannin industries of growing stands from acorns so treated are discussed.

396. MCDERMID, R. W., and BRANTON, D. W. **Repellent-treated Longleaf Pine seeds retain viability during 15-day refrigeration.** *LSU For. Notes La. Agric. Exp. Sta.* No. 33, 1959. pp. 2.

In a study of 12,800 *Pinus palustris* seeds tested with 32 treatments, it was established that repellent-treated seed keeps better under refrigeration (34° F.) than at air temperature. The treated seed may be kept under refrigeration for ⩾ 15 days without loss in viability after 10 days, whether treated or not. Best results were obtained with a repellent composed of 5% Arasan blended with 0·5% endrin. It should be noted that these results were obtained by storing small amounts of seed; large quantities of stored treated seed might react differently.

397. CRAIG, F. G. **The germination of Eucalypt seeds treated with paradichlorbenzene.** *For. tech. Pap. For. Comm. Vict.* No. 1, 1959 (7–8).

Treatment of stored Eucalypt seeds with *p*-dichlorbenzene for up to 3 years had no effect on germinative energy or capacity. The treatment is recommended as a protection against insect attack. The species tested were *Eucalyptus dumosa*, *E. bridgesiana*, *E. viridis*, *E. scabra*, *E. alpina* and *E. maculata*.

232.318. Seed Testing. Germination Tests. Seed Quality

See also Nos. 359, 385, 414, 422.

398. HEASLIP, M. B. **Effects of seed irradiation on germination and seedling growth of certain deciduous trees.** *Ecology* 40 (3), 1959 (383–8). 5 refs.

Dormant seeds of 18 species native to the Eastern Deciduous Forest were irradiated with large doses of Co^{60} γ-rays. Seed irradiation affected germination, seedling growth, and survival of each species in an individual fashion. Survival of seedlings from seed irradiated with 10,000r is < 30% of that of controls for half these species in the laboratory and for 7 out of 11 in the field. *Liquidambar styraciflua* and *Fraxinus americana* were the only species that germinated and had any survival after seed irradiation with 100,000r. The radiosensitivity of the seed of 7 species was tested during and after dormancy; critical levels of seed irradiation were found to be much lower after dormancy had been broken. *From author's summary.*

399. BOUVAREL, P., and LEMOINE, M. L'examen des graines forestières aux rayons X. **[The examination of forest tree seeds by X-rays.]** *Rev. for. franç.* 11 (8/9), 1959 (618–24 + 2 plates). 8 refs. [F.]

Reviews literature (mainly Scandinavian), and describes an apparatus now in use at Nancy. [Cf. *F.A.* 19 Nos. 332, 4088.]

400. POPESCU, J., and NICULESCU, T. Aplicarea razelor X in controlul semințelor forestiere. **[The use of X-rays in the examination of forest seed.]** *Rev. Pădurilor* 74 (2), 1959 (82–4). 2 refs. [Rum. russ.g.f.e.]

Reproduces and comments on X-ray photographs of seed of *Pinus nigra*, *Tilia platyphyllos*, *Cornus sanguinea*, and *Quercus sessiliflora*.

401. BRISCOE, C. B., and DUBARRY, A. P., JR. **A simplified germination test for American Sycamore.** *Tree Plant. Notes* No. 35, 1959 (21). 3 refs.

Germination tests of *Platanus occidentalis* seed in

tapwater required less space, less equipment and fewer man-hours than standard tests by sowing in sand flats, and gave a much higher % germination (average 19·5 vs. 8·5), providing a more accurate indication of the germinative capacity of the seed lot.

402. HOLMES, G. D., and BUSZEWICZ, G. **The assessment of seed sowing value.** *Quart. J. For.* 53 (3), 1959 (220–7).

Results of laboratory germination tests and field sowings of 6 coniferous species in each of the years 1950–56 showed that the laboratory test values give a close estimate of the sowing value in terms of potential field germination, but estimation of probable plant % (yield of seedlings at 1 year) is more difficult. The need to consider past productivity at each sowing site in interpreting the results of laboratory tests is discussed. This is usually done by means of a 'germination and survival factor' representing the ratio of seedling yields to the number of viable seeds sown, calculated on the basis of past experience. Normal seed qualities and recommended average sowing densities for 14 coniferous species commonly grown in the U.K. are given in a table.

403. CRISTESCU, V., *et al.* Stabilirea indicilor calitativi ai semințelor pentru 77 de specii forestiere. **[The determination of indices of quality for seed of 77 forest tree species.]** *An. Inst. Cerc. Silv., București (Ser. I)* 18, 1957 (9–45). 6 refs. [Rum.russ.f.]

Data for each species are tabulated. The factors on which the quality index is based are germination %, weight and purity, and these are analysed statistically and means and S.E.'s given. Indices based on Soviet and Hungarian standards are given for purposes of comparison.

404. SEBASTIAN, C. Essais de germination de quatre espèces du genre *Juniperus.* **[Germination tests on four *Juniperus* spp.]** *Bulletin de la Société des Sciences Naturelles et Physiques du Maroc, Rabat* 38 (3), 1958 (115–22). 7 refs. [F.]

Seeds were first kept for 4 weeks in a humid atmosphere at 25° C. and then stratified for 3 months at 5°. Seed of *J. phoenicea* and *J. oxycedrus* germinated freely after stratification. *J. communis* and *J. thurifera* appear to have a double dormancy and possibly need two periods of chilling; in the conditions of this experiment very few seeds germinated and the plantules did not survive.

405. CURTIS, J. D. **Germinative capacity of Engelmann Spruce seed.** *Res. Note Intermt. For. Range Exp. Sta.* No. 58, 1958. pp. 3. 1 ref.

Presents tabulated results of germination experiments in 1955–57 on 17 lots of seed from 8 national forests. Stratification increased viability slightly and germinative energy considerably (germination after 8 days was 60·1 and 93·3% and after 13 days, 93·1 and 98·7% of total germination for unstratified and stratified seed respectively). The longest time for culmination of germinative capacity was 62 days.

406. LIMSTROM, G. A. **Yellow-Poplar seed quality varies by seed trees, stands, and years.** *Sta. Note Cent. St. For. Exp. Sta.* No. 134, 1959. pp. 2.

Seed was collected over 3 years from 5 trees of *Liriodendron tulipifera* in each of 6 stands in 3 states. The number of 1-year seedlings obtained from equal quantities of seed varied as much between trees in a stand as between stands of different geographical location, and also varied from year to year for one tree.

232.32. Plant Rearing. Nursery Practice

See also Nos. 266, 375.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

407. ARMSON, K. A. **The use of farmyard manure in forest tree nurseries.** *For. Chron.* 35 (2), 1959 (100–3). 5 refs.

Manures sampled had high pH values and high Ca contents, both of which are generally considered unsuitable for growing conifer stock. Use of manure is also an uneconomical way of adding N to the soil, costing $150 to provide 147 lb. N/acre vs. $17.50 for NH_4NO_3 and $22.50 for $(NH_4)_2SO_4$.

408. MOSER, M. Die künstliche Mykorrhizaimpfung an Forstpflanzen. III. Die Impfmethodik im Forstgarten. **[Artificial inoculation of forest plants with mycorrhizae. Part 3. Methods of inoculation in forest nurseries.]** *Forstwiss. Cbl.* 78 (7/8), 1959 (193–202). 11 refs. [G.g.]

[Cf. *F.A.* 20 Nos. 1734–5.] Discusses various methods of inoculating soil in nurseries with a peat medium containing mycorrhizal fungi. These are: ploughing the mycorrhizal peat (m.p.) into the soil; applying m.p. in the seed drills and sowing directly in it (this method is best used with quick germinating seeds); inoculating during transplanting by placing m.p. in the transplant drills; and inoculating plants in beds (without transplanting) by burying m.p. between the rows in drills as near to the plants as possible. The best time to inoculate is the end of April to June, when the periods of most active root development and mycelial growth coincide; the next best period is the end of July to Aug., when root growth reaches a second (but lower) maximum. It is important to avoid fertilizer treatments that can have an adverse influence on the mycorrhizal fungi (e.g. lime, boron), to choose fungi of suitable provenances, and to use the most versatile fungus species.

409. SOBOTKA, A. Čisté mycelium, mykorrhizní půda a výživne kořínky modřínu na pokusné ploše ve školce. **[Pure mycelium, mycorrhiza-infected soil and the feeding rootlets of *Larix decidua* in an experimental nursery plot.]** *Věd. Práce Výzkum. Ust. Lesa Mysl., Praha* No. 1, 1957 (43–51). 3 refs. [Cz.russ.g.]

Examines the use of (1) pure mycelium (*Ixocomus* [*Boletus*] *elegans*), and (2) mycorrhiza-infected soil, as growth stimulants for *L. decidua* seedlings. Mycorrhizae were induced by applying (1) in a liquid nutrient medium, the treatment being inconclusive since mycorrhizal development was also observed on an untreated control plot (an older forest nursery with fungus-rich clay-loam soil). In the first year, seedling mortality was thrice that of

controls but at the end of the second growing season increment of the treated plants was 80% more than that of controls. Seedling mortality for treatment (2) in the first year was twice that of controls, plant growth being 18% greater in the second year. [Cf. *F.A.* 19 Nos. 182, 3944–5.]

410. AZEVEDO, N. F. DOS SANTOS DE. Micorrizas em *Pinus radiata* D. Don. [**Mycorrhizae in *P. radiata*.**] *Estud. Inform. Serv. Flor. Aquic. Portugal* No. 107–C3, 1959. pp. 13 + 1 plate. [Port.port.e.] Limited distribution.

Describes successful experiments in inoculating *Pinus radiata* seedbeds with mycorrhizae. Inoculated compost was introduced at a rate of 70 kg./63 sq. m. Seedlings 7–8 months later showed well developed roots having ectotrophic mycorrhizae.

232.323. Sowing and Covering

See also Nos. 392, 402, 416.

411. RUBŢOV, Ş., BÎNDIU, C., and MARIAN, A. Contribuţii privind productivitatea pepinierelor de molid şi pin. [**The productivity of Spruce and Pine nurseries.**] *An. Inst. Cerc. Silv., Bucureşti* (*Ser. I*) 19, 1958 (91–8). 2 refs. [Rum.russ.e.]

A study was made over 5 years in several nurseries, to determine optimum spacing for maximum production of 1st-class plants. Optimum density varied with site quality: for Spruce it was 60–100 plants per metre of drill on soils of medium fertility, 40–80 on less, and 50–120 on more fertile soils. Optimum density on medium soils was 60–70 for Scots and 50–60 for Austrian Pines.

412. EINSPAHR, D. W. **Nursery production of Aspen seedlings.** *Tree Plant. Notes* No. 35, 1959 (22–4). 1 ref.

Experiments indicate that seedlings of *Populus tremuloides* and *P. grandidentata* suitable for field planting can be obtained in one season by sowing in sterilized seedbeds covered with a layer of acid sand; daily watering and screening against rain drops are necessary until early July, when the screens are removed and watering done twice weekly.

413. DUMITRESCU, N. Contribuţii la cultura paltinului de munte (*Acer pseudoplatanus* L.) in pepiniere. [**Raising *Acer pseudoplatanus* in the nursery.**] *Rev. Pădurilor* 74 (7), 1959 (396–7). [Rum.russ.g.f.e.]

One-year seedlings suitable for planting out were obtained by sowing in the autumn and covering the seedbeds in the spring, before the snow had completely melted, with a layer of straw ca. 20 cm. deep, which delayed snow melt and protected the seedlings from late frosts. The straw was removed about the middle of May.

414. GARCIA SALMERON, G. Sobre la época de siembra en los viveros de *Pinus halepensis* Mill. [**Time of sowing in *P. halepensis* nurseries.**] *Montes, Madrid* 15 (87), 1959 (249–56). [Span.]

Tests were made to determine the optimum temperatures for germination of *P. halepensis* seed, using a testing period of 30 days. Germinative energy (g.e.) increased from 13° C. up to 18°, which was the optimum. At temperatures < 13°, g.e. was below that of the worst-quality seed at optimum temperatures. With temperatures > 22°, on sand having moisture contents of 15, 20 and 25% of the dry weight of the sand and with a relative air humidity of 90–95%, g.e. declined rapidly, the effect being particularly noticeable during the last 10 days of the test. These facts illustrate the adaptation of *P. halepensis* to the climate of its natural habitat, in that spring temperatures will encourage germination, while summer temperatures inhibit it, even during sporadic summer rains. Some data are given on soil and air temperatures in the Segura basin, to illustrate the use of such information to determine the best times of sowing.

415. TĂNĂSESCU, S. Observaţii cu privire la cultura ulmului de cimp in pepiniera 'Mofleni'. [**Observations on the raising of *Ulmus campestris* in Mofleni forest nursery.**] *Rev. Pădurilor* 73 (12), 1958 (707–9). [Rum.russ.g.f.e.]

Results are given of experiments with 20 variants of sowing depth and type of covering. Best results were obtained by covering to a depth of 2 cm. with nursery soil mixed with sand. Stable manure encouraged weed growth.

232.324. Transplanting and Lining Out, including Grading of Seedlings

See also No. 478.

416. PAPADOPOL, S. Corelaţia dintre diametrul la colet şi înălţimea puietului de paltin de munte (*Acer pseudoplatanus* L.). [**Correlation between the root-collar diameter and the height of *A. pseudoplatanus* seedlings.**] *Rev. Pădurilor* 74 (1), 1959 (21–3). 6 refs. [Rum.russ.g.f.e.]

Derives two equations from which the root-collar diameter may be obtained if height is known, for nursery seedlings grown (1) at irregular spacing, (2) at 25 plants/m. of drill. Also suggests the construction of a nomogram for use in sorting seedlings.

232.325. Tending (in both Seedbeds and Transplant Beds)

417. ZEYHER, M. Kamp-Pflegegeräte. [**Nursery-tending tools.**] *Forstarchiv* 30 (6), 1959 (122–4). [G.]

Gives information on the size and performance of various types of hoes and cultivators of German make and the conditions for which they are suitable, with a short section on motor cultivators.

418. CARTIER, R. D., and COITEUX, F. Le contrôle des mauvaises herbes dans les pépinières sylvicoles. [**Weed control in forest nurseries.**] *Extr.* from *Rep. Quebec Soc. Prot. Pl. 1958*, 1956 (81–3). [F.]

Experiments were made with pre-emergence sprays on sowings of *Pinus resinosa* and *Picea mariana*. Herbicides tested were (in order of efficacy): Premerge 1 gal./acre, EPTC 8 lb./acre, CIPC 4 lb./acre, Dalapon 8 lb./ acre, and CIPC granular at 160 lb./acre. All gave good weed control and none appeared to have a significantly adverse effect on the seedling crop.

232.326. Salvage of Overgrown Seedlings and Transplants. Root or Shoot Pruning etc.

See No. 128.

232.327. Protection Measures in Nurseries

See Nos. 412–3, 503, 585, 624–6.

232.328. Vegetative Propagation

See also Nos. 108, 129, 131, 359, 478, 1291.

419. ACHTERBERG, H. H. Zur vegetativen Triebvermehrung einiger Forstgehölze. **[Vegetative propagation of some forest species by cuttings.]** *Forst u. Jagd* 9 (2), 1959 (59–60). [G.]

Briefly reports on trials, chiefly with Spruce and Douglas Fir, but also Silver Fir, Yew, Larch, Elm and Ash, including the effect of various growth regulators and vitamins. In general, shoots from the lower parts of the crown, and shoots from younger trees rooted best. A substrate of gravel and sphagnum moss gave best results, except for Douglas, which rooted best in the A horizon from a Douglas stand. Rooting generally took over a year. Transplanting after a year or two into a fresh medium was beneficial. Solutions of growth substances were more effective than dusts, and combinations more so than individual substances. Individual differences between trees often obscured the effect of growth substances.

420. OOYAMA, N. **[Studies on the causes of lowering rooting ability of the cuttings from old trees of Sugi (*Cryptomeria japonica* D. Don) and the methods of promoting rooting.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (91–132 + 4 plates). 39 refs. [Jap.e.*e.*]

As a result of experiments the following conclusions were reached: (1) Rooting ability in trees of > 50 years is low and even in the case of successful rooting the number of roots is few. Many cuttings from old trees root only in the second year after planting. When a cutting from an old tree has rooted successfully, secondary cuttings taken from it root more easily and also produce a greater number of roots. (2) Treatment with synthetic growth regulators was very effective, raising rooting rate from 5–10% on untreated plots to > 90% on treated. A 0·01% concentration of NAA gave good results. Previous treatment with $KMnO_4$ is most effective for removing the growth inhibitor which is supposed to be one of the causes of poor rooting. Unlike ordinary shoots, adventitious shoots root readily.

421. OOYAMA, N. **[The effects of leaf sprays of urea on rooting of *Cryptomeria japonica* cuttings. Studies on races difficult to root in the Kitayama district of Kyoto.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 105, 1958 (163–85). 16 refs. [Jap. jap.e.*e.*]

Summarizes experiments with cuttings from trees of various races and ages, using different rooting techniques and soils. Planting cuttings with their ends covered by a ball of red earth was beneficial in soils where rotting or drying out were great dangers. Rooting capacity of cuttings from young trees (5 years) was good (85–92·5% for untreated controls) even for Shibahara Sugi, the most difficult race, but decreased considerably with increasing age. Urea sprays and, somewhat less, sprays of 'Folium' (20% each of N, P_2O_5 and K_2O) improved rooting %s, particularly in difficult races. For Shibahara Sugi 0·1–0·2 g. of urea per cutting from 25-year-old trees was considered best, with greater quantities for cuttings from older trees. Optimum concentration appeared to be 0·75%, higher concentrations leading to injuries. Effects increased with number of sprayings up to ca. 8, less than 4 having little effect. Spraying was most effective if begun 5 days after planting.

422. MAKSIĆ, S. Razmnožavanje foja (*Juniperus foetidissima* Willd. i *Juniperus excelsa*, Bieb.) i ispitivanje klijavosti njihovog semena. **[Propagation of *J. foetidissima* and *J. excelsa* and investigations of the soundness of their seed.]** *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 10, 1957 (253–62). 1 ref. [Serb.scrb.g.*g.*]

Experiments in rooting *J. foetidissima* between Oct. 1954 and Jan. 1957 in a greenhouse at Skopje resulted in a survival of 26 out of 200, i.e. 13%—a figure much lower than expected, possibly because warmth and moisture were far from optimum. When (*a*) 900 seeds of *J. foetidissima* and (*b*) 3300 of *J. excelsa* were cut open, 11–37% of (*b*) but none of (*a*) had living embryos. In 1955–56, 2000 fruits of *J. excelsa* were sown, yielding after 2 years a total of 40 seedlings. Both the rooting of cuttings and seed germination appear to take a very long time.

423. ENRIGHT, L. J. **Growth response of rooted cuttings of Pine and Spruce.** *J. For.* 57 (7), 1959 (509–10). 1 ref.

Compares the height, and branch and root systems, of 1-year-old rooted cuttings and 2-year-old seedlings of *Picea abies*, *Pinus resinosa* and *P. strobus*, to the advantage of the rooted cuttings. [Cf. *F.A.* 20 No. 4475.]

424. GREENE, J. T., and REINES, M. **Rooting of Slash Pines in open hotbeds.** *Tree Plant. Notes* No. 35, 1959 (25).

Cuttings taken from 2-year *Pinus elliottii* seedlings, dipped in 0·3% IBA, and planted in beds with 3 in. of stable manure covered by 2 parts sifted soil, 1 part sand, and 1 part old (25 years) sawdust, gave 77% rooting after 170 days.

425. DRAGOMIR, N., and DURAN, V. Cultura plopului alb (*Populus alba* L.) din butaşi şi prin repicarea puieţilor din seminţişuri in pepinieră. **[Propagation of *P. alba* by cuttings and by wilding seedlings transplanted in the nursery.]** *Rev. Pădurilor* 74 (1), 1959 (26–9). [Rum.russ.g.f.e.]

Populus alba having proved one of the most successful species for the afforestation of coastal dunes, experiments have been made to determine the best method of producing large quantities of planting stock. One method was to encourage the production of seedlings in existing stands by hoeing to a radius of 10 m. round suitable trees growing in depressions in the dunes, before seedfall, and then to transfer the 1-year seedlings to a nursery for another

year. The material for propagation by cuttings consisted of coppice shoots ca. 2 m. long and 3 cm. in diam., collected in early March, heeled in in the nursery until mid-March, and then made into cuttings (ca. 30 cm. long and 1-2 cm. in diam.) which were stratified in sand until 10 April, then soaked in cold water for 36 hours, disinfected with 1‰ formalin, and planted. Analysis of costs showed that 1 + 1 planting stock obtained by the first method cost less than 2-year rooted cuttings, but that the latter were superior in height and diameter.

426. BINDIU, C. In legătură cu inmulţirea pe cale vegetativă a plopului alb (*Populus alba* L.). [**The vegetative propagation of *P. alba*.**] *Rev. Pădurilor* 74 (4), 1959 (206–9). [Rum.russ.g.f.e.]

Experiments were made in propagating *P. alba* from lignified stem cuttings, in hotbeds and directly in the nursery, with and without application of growth regulators. Planting in nursery beds was unsuccessful even with the use of growth regulators. Best results in the hotbed were obtained when using β-IAA on a sand substrate (60% rooting) or α-NAA on a sawdust substrate (68%) compared with untreated controls (24–30%).

427. **Vegetative propagation of Poplars.** *Extr.* from *Rep. Cent. St. For. Exp. Sta. 1958*, 1959 (33–4).

Stem cuttings, taken in the dormant season and placed in cold storage, of *Populus deltoides* and two clones, the Sherill and the Shimek, of natural crosses of *Populus grandidentata* and *P. alba*, in lengths of 8, 12, 16 and 20 in., were planted on 4 dates in April–May, leaving 2 in. above ground. The plots were mowed in summer to reduce weed competition. The effects of size of cutting were marked in the hybrids, results varying from < 10% survival and < 1 ft. growth for 8-in. cuttings to > 30% survival and ca. 3 ft. growth for 20-in. cuttings. Survival and growth also increased with higher initial diams. (< ½ in. to > 1 in.). *P. deltoides* rooted much more successfully than the hybrids, and cutting size had less influence on survival, though its relationship with height growth was similar. Date of planting was in no case significant.

428. TOMZA, B. Wpływ grubości i długości zrzezów topolowych na wzrost sadzonek w pierwszym roku. [**The influence of diameter and length of Poplar cuttings on the first-year increment.**] *Zesz. nauk. Szkol. Gospod. Wiejsk. Warsz.* (*Leśn.*) No. 2, 1959 (121–37). 16 refs. [Pol. g.russ.]

Trials with cuttings of *Populus* 'Manitobensis' of lengths 2, 5, 10, 15, 20, 25 and 30 cm., and diameters 3–5, 5–7, 7–9 and 9–12 mm., showed that longer cuttings gave stronger plants, and that under average conditions the 2-cm. cuttings soon died. A definite relation was found between height increment and length of cutting up to 15 cm., but no relation between height and diameter of cutting. The coefficient of variation for height at one year was 34%. The experimental material was inadequate to allow the desired accuracy of calculation.

429. KAN, W.-H., and HO, C.-H. [**Experiment on the vegetative propagation of *Tamarix aphylla*.**] *Bull. Taiwan For. Res. Inst.* No. 60, 1959. pp. 10. 7 refs. [Chin.e.]

Experiments were made on the rooting %, and height and diameter growth of cuttings of different lengths (6, 9 and 12 cm.) and diameters (3·1–6·0 to 12·1–15·0 mm.). The longest cuttings with the largest diameters gave the best results, but from an economic point of view those 12 cm. long with diam. 3·1–6·0 mm., and 6 cm. long with diam. 12·1–15·0 mm., both giving a rooting of 78·75%, would probably prove satisfactory in practice. *From authors' summary.*

430. PREMUDA, G. Probabili prospettive di una antica pratica: 'il margottaggio'. [**Future prospects of an ancient practice: marcottage.**] *Monti e Boschi* 10 (6), 1959 (279–83). [It.]

Describes modern methods of marcottage, making use of growth-regulating substances and polythene wrappings, and gives some account of the author's successful trials with *Pinus pinea*, *Cedrus atlantica*, *Taxus baccata*, *Cupressus arizonica*, *C. sempervirens*, *Myrtus communis* and *Magnolia grandiflora*.

431. PERSSON, S., and BANG, C. Luftavläggare av tall. [**Air layering of Scots Pine.**] *Svenska SkogsvFören. Tidskr.* 57 (2), 1959 (303–8). 4 refs. [Sw.e.e.]

Briefly reports on experiments at the Swedish Forest Research Institute. Mean rooting %s decreased from ca. 12 for 5-year to 3 for 10-year trees (the maximum age probably being about 15 years) but varied greatly between individuals. Height on tree of the layered shoots did not affect results. No rooting took place without the use of growth regulators (0·2 g. of 0·5 or 1% IBA in talc).

432. MCALPINE, R. G., and JACKSON, L. W. R. **Effect of age on rooting of Loblolly Pine air-layers.** *J. For.* 57 (8), 1959 (565–6). 3 refs.

On trees aged 2–24 years, 432 air layers were made, using a procedure already outlined [see *F.A.* 16 No. 2935]. Rooting was best in the youngest age classes and decreased sharply with increasing age. Ca. 80% of layers in 2-year plants rooted, but none in trees ⩾ 17 years old. There was considerable variation among trees within a single age class in the number and weight of roots formed, and some evidence of variation in rooting capacity between individuals within an age class.

433. CURSCHMANN, O. H. Erfahrungen bei der Anlage einer Samenplantage. [**Practical experience in the establishment of a seed orchard.**] *Forst u. Jagd* 8 (12), 1958 (519–26). [G.]

Deals chiefly with grafting of conifers, including *Abies grandis* grafted successfully on to *A. concolor* but not to *A. alba* stocks.

434. HOLST, M. J., and SANTON, J. B. **Interspecific grafting of hard Pines.** *Proc. 6th Mtg. Comm. For. Tree Breeding Can., Montreal 1958, Part 2*, 1958 (*R*13–*R*14).

A series of reciprocal scion/rootstock combinations of (*a*) *Pinus banksiana*, (*b*) *P. resinosa* and (*c*) *P.*

sylvestris were made at Petawawa during winter 1954–55. The rootstocks of half the grafts were pruned back in May 1956. Initial survival of the reciprocal (*a*)/(*b*) combinations was very low and dropped further during the 2-year observation period, but survival of (*b*) scions on (*a*) rootstocks was nearly 3 times that of (*a*) on (*b*) when rootstocks were left unpruned. When rootstocks were pruned both (*a*) and (*b*) scions died within a year. Survival of (*a*)/(*c*) combinations was 86% for (*a*) on (*c*) and 96% for (*c*) on (*a*) when unpruned, and this difference was increased on pruned stock. There was no difference in scion survival for the non-pruned rootstocks in the reciprocal (*b*)/(*c*) combinations but with pruned stocks, survival of (*c*) on (*b*) remained at 96% while that of (*b*) on (*c*) dropped to 82%. The relevance of these findings to the evolutionary position of the 3 species is discussed.

435. JOHANSEN, R. W., and KRAUS, J. F. **Fertilizing cleft and bottle graft scions in an attempt to increase graft unions.** *J. For.* 57 (7), 1959 (511, 514). 3 refs.

Forty *Pinus elliottii* scions were bottle-grafted on to potted stock, half the bottles being filled with a nutrient solution, the others with water. Of 40 cleft grafts, half were sprayed weekly with nutrient solutions and the others left untreated. Both types of graft were adversely affected by the fertilizer treatment, and for further studies, lower concentrations of nutrient solutions are suggested.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See also No. 86.

436. **Seedling potting device.** *For. Equipm. Note, FAO* No. *A.*1 *Tec.* 59, 1959. pp. 2.

A simplified version of the original potting device described in *For. Equipm. Note, FAO* No. *A.*4.54 [see *F.A.* 16 No. 4034] for potting up seedlings in paper pots, has been developed for use in Turkey, and is described with scale diagrams.

437. **Nursery research.** *Extr.* from *Rep. For. Dep. Uganda 1957/58*, 1959 (25).

Successful experiments have been made in the use of open-ended conical tarred-paper pots for conifer planting stock (5 in. deep, 3 in. top and 2 in. bottom diam.) at a cost of 60*s.*/1000. For Eucalypts, 4-in. 150-gauge polythene tubing cut into 4-in. lengths makes neat containers costing only ca. 20*s.*/1000 but difficult to handle. Very satisfactory pots can be made by cutting down discarded 'Tetrapak' milk containers, which can be obtained in vast quantities from the local township dump and made at a rate of 350–400/man-day. The smell is somewhat overpowering but the results are well worth it; being walled in grease-proof material with polythene lining, the pots are extremely robust and durable.

438. **'Melap' device for balling planting stock.** *For. Equipm. Note, FAO* No. *A.*15.59, 1959. pp. 1.

[Cf. *F.A.* 19 No. 4234.] Describes (with photograph) a device developed in the Cameroons for balling planting stock in the tropics. A mixture of one part clay, 1 part chopped straw and 3 parts humus is used. An unskilled labourer can ball 600, and a skilled worker 800 plants per day with this device, and in trials with > 100,000 plants, survival was 95%.

232.33. Formation of Stands by Direct Sowing

See also Nos. 320, 362.

439. PUOSKARI, O. Urakkatyöarvoja männyn kylvössä. **[Piece rates in sowing Pine.]** *Metsät. Aikak.* 1959 (6/7), (241–4). [Fi.e.]

Discusses two types of planting hoe, and presents piece-rate tables for different categories of working difficulty. *From author's summary.*

440. MATSUMOTO, M., and HOSOI, M. **[Direct seeding of *Pinus densiflora* S. et Z.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (166–81 + 2 plates). 17 refs. [Jap.e.*e.*]

As a result of long observation and experiment it is concluded that direct sowing can be successful if (1) a seedbed is first prepared by removal of litter and humus to expose the mineral soil; (2) a complete fertilizer is applied to make good the nutrients thus removed; (3) birds and small rodents are controlled; (4) sowing is done early in the season so as to permit the development of good root systems before the summer drought; and (5) the site permits of easy weeding.

441. ALLEN, J. W. **White Pine in Western Washington.** *J. For.* 57 (8), 1959 (573–6). 4 refs.

Discusses stocking (1000–2000 million bd. ft.), annual cut (7 million bd. ft.), damage by blister rust and *Dendroctonus monticolae*, and the lack of local growth data. The earliest date when any commercial quantities of proven, blister-rust-resistant seed can become available is 30 years ahead. For preliminary testing, the most economical method of establishment appears to be aerial sowing with no attempt at *Ribes* control. No other species has shown the growth potential that *Pinus monticola* apparently has on large areas of low-class sites in W. Washington.

442. ŞCHIOPU, I. Semănături directe pe terenurile degradate din carstul dunărean. **[Direct sowing on degraded soils of the Danubean Karst.]** *Rev. Pădurilor* 74 (3), 1959 (146–50). 7 refs. [Rum. russ.g.f.e.]

Gives some results for *Quercus sessiliflora, Q. cerris, Pinus nigra, Robinia pseudoacacia, Gleditsia triacanthos, Juglans nigra, J. regia, Castanea sativa, Aesculus hippocastanum, Ailanthus altissima, Prunus avium, P. cerasifera, P. mahaleb, Acer tataricum, Fraxinus ornus*, and some shrubs.

443. **[An experiment on direct sowing of *Haloxylon persicum* in Chingho desert, Sinkiang [Uighur Autonomous Region].]** *For. Sci., Peking* 1959 (4), (299–309). [Chin.e.]

Direct sowing gave rapid germination and uniform seedling stands, early spring being best. Heights of 60 cm., root collar diameters of 1·7 cm., and root depths of > 100 cm. were reached in 4 months. With irrigation and weeding, these performances can

be bettered. The best seed rate is 166 g. per mu (0·061 ha.), and one worker can broadcast by hand 8–10 ha./day.

232.4. Formation of Stands by Planting

See also Nos. 347, 362.

232.41. Planting Stock (Type, Handling and Treatment)

See also Nos. 226–31, 425.

444. PICCAROLO, G. Il servizio di riconoscimento e di certificazione per garanzia nella pioppicoltura industriale. **[A service for identification and certification in commercial Poplar growing.]** *Cellulosa e Carta* 10 (8), 1959 (5–14). [It.f.e.g.]

Surveys the existing difficulties and confusion in the field of Poplar breeding in Italy in respect of the identification of species and nomenclature of clones, and gives a draft scheme for official regulation as requested by the International Poplar Commission.

445. AFANASIEV, M., ENGSTROM, A., and JOHNSON, E. W. **Effects of planting dates and storage [of stock] on survival of Eastern Red Cedar in Central and Western Oklahoma.** *Bull. Okla. Agric. Exp. Sta.* No. *B*-527, 1959. pp. 19.

An attempt, based on the results of planting *Juniperus virginiana* during 3 consecutive years from 1955, mainly to determine (i) the existence and extent of an optimum planting period, and (ii) the effects of practical short-term storage of stock from the nursery. In addition, the effects of some elements of weather and soil on plant mortality were studied, and a comparative evaluation of the use of potted stock in field planting, and of stock planted the same day as lifted, was made. Using the slit method of planting in all cases, thirty 2-year seedlings were planted 1 ft. apart in 3 random 10-tree lots two days after being lifted in the nursery; a second 30 plants remained packed in waterproof paper and sphagnum moss for one week before planting. This procedure was followed at 4 sites. The optimum periods of planting proved to be between mid-December and mid-March, though this did not preclude successful results before and after those dates, and high survival was observed in individual lots planted in the dormant season. The wide variation of soil and weather conditions precludes the fixing of specific dates for field planting but, in general, planting in January and February is more successful than earlier or later. The mean survival rates of trees planted on arrival and after a week's storage were 70·99 and 70·43% but, despite the very slight difference, packaged stock should be kept moist and well sheltered to avoid injury from drying or temperature extremes. During the low-precipitation seasons of 1956 and 1957, the combined mean survival of potted plants was 95·69 compared with 69·86% for bare-rooted stock. This advantage was not apparent for the good-rainfall year, when 93·70% of bare-rooted stock survived. Survival for stock planted straight after lifting was 10% greater than that for stock planted 2 days after lifting or after 7 further days of storage.

446. HORVÁTH, I. Erdeifenyö (*Pinus silvestris* L.) csemeték nevelésének néhány emléti kérdése. 1. Egyéves csemeték vermelése. **[Theoretical problems of raising *P. sylvestris* seedlings. 1. Heeling-in of one-year-olds.]** *Erdész. Kutatás., Budapest* 1958 (1/2), (191–203 + 3 dgms.). 9 refs. [Hu.hu.russ. e.g.]

A two-year study of heeling-in led to the conclusion that the practice has an adverse effect on the seedlings, especially on their root systems; this is shown by the low survival after heeling-in, and by the decrease in seedling weight while heeled-in. There was no evidence that the adverse effect of heeling-in was caused by the consumption of reserve nutrients. Heeling-in checked the circulation of N and P, and this was still in evidence during the following growing season. The synthesis of nucleic acid by the roots was also disturbed by heeling-in. Anaerobic respiration of the roots is considered to be the probable cause of the deterioration during heeling-in, but further research is needed to confirm this.

447. **Establishment experiments.** *Extr.* from *Rep. For. Dep. Fiji 1958*, 1959 (6).

Experiments with both potted and unpotted Pines showed that no *Pinus caribaea* should be planted out bare-rooted in any part of Fiji, but that *P. elliottii* at higher altitudes, above ca. 1500 ft., can be planted bare-rooted with effective survival rate. Eucalypts cannot be planted bare-rooted. Excellent response was shown by Eucalypts to the application of a complete fertilizer in the holes at the time of planting. After 8–9 months' growth, average height for the 5 species used was 1 ft. 2 in.–2 ft. 8 in. on control plots and 3 ft. 1 in.–5 ft. on treated plots, the best response coming from *Eucalyptus grandis* with 243% increase in height growth.

448. DUFFIELD, J. W., and EIDE, R. P. **Polyethylene bag packaging of conifer planting stock in the Pacific Northwest.** *J. For.* 57 (8), 1959 (578–9). 7 refs.

Since winter 1955–56 a large nursery in Washington has made experimental and then full-scale commercial shipments of seedlings completely enclosed in 3-ply, multi-wall kraft bags with a thin polythene lamination on the inner wall. More than 80% of the plants are 2 + 0 Douglas Fir, but seedlings of six other coniferous timber species of the Pacific Northwest have also been packed and transported successfully. The advantages of the bags, including ease of handling, strength, and good results from the planting stock, are discussed. [Cf. *F.A.* 16 No. 1689.]

232.42. Methods of Planting (including Use of Fertilizers etc.)

See also No. 447.

449. SÖDERSTRÖM, V. Några orienterande studier angående marktemperatur och barrträdsplantors rottillväxt i plantrutor och under hyggesvegetation. **[Preliminary studies on soil temperatures and the root growth of young conifers on planting spots and in the natural vegetation of clear-felled areas.]** *Svenska*

SkogsvFören. Tidskr. 57 (1; 2), 1959 (171–98; 281–302). 21 refs. [Sw.sw.]

Part I reports on measurements under different conditions of soil and vegetation [cf. *F.A.* 19 No. 1623] at depths corresponding to the root zone of young plants when planted (*a*) vertically on scalped patches, (*b*) vertically without scalping, and (*c*) slanting, with roots horizontal near the borderline of humus and mineral soil. Available warmth for root development is expressed as accumulated temperatures in excess of 10° C. at these levels. It was markedly greater for (*a*) than for (*b*), while (*c*) was about equal to (*a*) (except on a moraine soil with very dense grass; in this soil—the warmest of those studied—the order of warmth was (*a*) > (*c*) > (*b*)). All differences were greatest in spring. Part II reports on root growth in (1) a clay soil with dense, and (2) a sandy soil with sparse vegetation, using the 3 planting methods described in Part I, whose ranking is confirmed. Differences between (*a*) and (*b*) were greatest for Pine, and smallest for Spruce, on (1). Measurements of temperature and moisture suggest that temperature may account for most of the difference in Spruce, while moisture (competition of the dense grass) appeared to be an important factor in the poor growth of Pine roots under method (*b*).

450. SÖDERSTRÖM, V. Synpunkter på orsakerna till första årens plantavgång vid olika metoder för barrträdsplantering. [**Causes of plant mortality in the first year with different planting methods.**] *Norrlands SkogsvFörb. Tidskr.* 1959 (2), (103–216). 31 refs. [Sw.]

(1) *Planting study*: Various planting methods (*a*) with or (*b*) without soil cultivation for Pine or Spruce were studied in 1952–56 on 2 sites in Jämtland and 3 in Västmanland. During the first year after planting mortality was significantly higher for (*b*), but on the Jämtland sites, studied over a longer period, the differences between (*a*) and (*b*) were insignificant after 6 or 7 growing seasons. Differences in mortality within the two groups were generally not significant. Plant mortality was closely related to drought and, on one site, to frost. Plants in group (*b*) were more susceptible to drought than those in (*a*). In (*b*), mortality was heaviest where ground cover was thickest and least where it was sparse or lacking; in (*a*), there was no significant relationship between mortality and ground vegetation during the first growing season, but by the third the relationship was close. During the first growing season leader length was the same for (*a*) and (*b*), but height growth for (*a*) gradually exceeded that for (*b*); by the 6th and 7th growing seasons, however, differences between (*a*) and (*b*) were insignificant for height and diameter growth and needle length on the leader. On the site where frost damage occurred, early leader growth was higher for (*b*). (2) *Root development*: In 1958, sites in 3 districts were planted with 2 + 0 Pine or 2 + 1 Spruce, by slant planting or vertical-root planting and with the planting spots cultivated, or in grass, or on grass-free areas. Sample plants were lifted for root measurement at weekly intervals from June to August and soil moisture and temperature measurements were made. On all sites but one, root growth was better on cultivated planting spots. Root growth of slant-planted Spruce was especially good on grass-free and especially poor on grass-grown spots; that of slant-planted Pine was poorest on grass-grown spots and not particularly good on grass-free ones, where vertical planting gave better results. The hypothesis that slant planting is preferable on grass-free and vertical planting on grass-grown spots held good on clay and silt, but not on sand, and proved more valid for Spruce than for Pine. The root systems of 2 + 0 Pine seemed to be more affected by drought than those of 2 + 1 Spruce.

451. SCHUBERT, G. H., and ROY, D. F. **Tests of sandwich planting and the mechanical planting hole digger in California.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 151, 1959. pp. 10.

Gives preliminary results from studies to investigate (1) the usefulness of a mechanical planting-hole digger that digs two concentric cylinders, an outer one of 36-in. diam. and 4–6 in. deep, and an inner of 9-in. diam. and ca. 9 in. deep; (2) the effectiveness of encasing seedlings in 'sandwiches' of water-absorbent fibrous material (ca. 3 × 8 in.); and (3) the effects of fertilizers on both types of planted seedling. (Douglas Fir and Ponderosa Pine seedlings were used in the studies.) (1) Offered some improvement over the conventional planting-hole method, particularly where certain kinds of competing vegetation covered the planting site, and gives promise for planting on gentle slopes and flat areas free of rocks and roots, but it requires further development and testing. (2) The first-year trials of 'sandwich' planting were disappointing and did not improve survival. Greatest mortality occurred among seedlings in 'sandwiches' to which fertilizers had been added. (3) Greatest stimulation by fertilizers occurred with bare-root seedlings.

452. VYPLEL, K. Aufforstung mit Erdbohrgeräten. [**Afforestation with plant hole borers.**] *Allg. Forstztg.* 70 (15/16), 1959 (184–6). [G.]

Reports on trials on mountain sites with (*a*) the Stihl BLK, an accessory to the Stihl one-man power saw, and (*b*) the heavier Stihl BL 241. Mechanical boring saved both time and money compared with hand work, particularly on steep (up to 70%) slopes with heavy grass, weeds or *Vaccinium*. Work with (*b*) was less strenuous and, because of fewer rests, faster, except on very steep slopes. On a comparable site, 2 men made 1255 holes per 10-hr. day with (*a*) and 1634 with (*b*) at costs per 1000 holes of Sch. 306 and 259 respectively.

453. ROTTY, R. **Oversize hole digger for arid zone planting.** *For. Equipm. Note, FAO* No. *A.*17. 59, 1959. pp. 4. [Cf. *F.A.* 20 No. 1766.]

454. SIMON, K.-H. Zur Bedeckung von Kiefernkulturen mit Spänen. [**Mulching of Pine plantations with chips.**] *Abstract of thesis*, in *Forst u. Jagd* 9 (8), 1959 (376–7). [G.]

Describes trials with (*a*) shavings and chips from the making of fence posts etc., and (*b*) slash. Temperatures and moisture conditions in the soil and

in the air above were measured, indicating greater temperature extremes in the growing season on the mulched plots, drier air, but better moisture retention in the soil. Growth effects varied, but (*b*) caused excessive growth of grass.

232.43. Spacing and Arrangement in Plantations

See Nos. 322, 851.

232.44. Season and Time of Planting

See Nos. 216, 445.

232.5. Artificial Formation of Stands by Vegetative Propagation

455. COSTIN, E. Fixarea şi valorificarea dunelor nisipoase prin procedeul butaşilor plantaţi adînc. **[The fixation and productive use of sands by deep planting of cuttings.]** *Rev. Pădurilor* 74 (1), 1959 (23–6). [Rum.russ.g.f.e.]

It was found that cuttings of *Populus nigra* var. *thevestina* 1·5 m. long, planted vertically so as to be completely covered by sand, gave 85·4% survival at the end of the second year when all other types of planting (both cuttings and seedlings, with and without the addition of humus) had failed completely.

233. Afforestation

See also Nos. 41, 44–5, 309, 349, 425, 442–3, 452–3, 455, 498, 873, 1272.

456. BODEUX, A. Les landes à callune de Campine et les conditions de leur forestation. **[The Campine *Calluna* heaths and conditions for their afforestation.]** *Repr.* from *Revue de l'Agriculture, Bruxelles* 10 (12), 1957. pp. 30. 10 refs. [F.] (In *Opera Collecta Cent. Bosbiol. Limburgse Kempen* 3, 1958.)

The vegetation of the heaths and the microclimate of 2 plots (each of 9 ares in extent), one cultivated and the other untouched, are described. On other plots, adequate natural regeneration of Scots Pine was found after 3 years where the vegetation had been removed and the soil cultivated, but not on plots similarly treated but with fertilizer added, on plots with vegetation removed only, or on untreated controls. Stocking after 2 years was satisfactory for Pine, Oak and *Rhamnus frangula*, where seed had been scattered broadcast or, with Oak, sown in holes 3 cm. deep and covered, on plots cultivated in strips 30 cm. wide to a depth of 15 cm., but not on those with the surface lightly scratched with a fork or burnt over, nor on untreated control plots. *Sorbus aucuparia* sowings gave good stocking under heather but not on bare soil. Birch gave poor results. Observations will be continued for several years.

457. KNABE, W. Vorläufige Richtlinien für die Bepflanzung und Melioration forstlicher Kippenstandorte in der Niederlausitz. **[Provisional instructions for the revegetation and amelioration of spoil-mounds for forestry use in Niederlausitz [Brandenburg].]** *Forst u. Jagd* 9 (5), 1959 (229–34). 9 refs. [G.]

Suggests tree species to be planted with or without previous planting of other species (legumes etc.) and/or fertilizing, according to topography and chemical and physical properties of the site. In particular, a method is described using ashes from soft coal (300–700 cu.m./ha.) in place of lime on very acid soils with poor permeability. On a site so treated, previously bare for 30–40 years and twice unsuccessfully planted, various Poplars, Birch and Alder did well.

458. BÁNKY, G. A Tarnavölgyi kopárfásítások értékelése. **[Afforestation of the barren land of the Tarna basin.]** *Erdész. Kutatás., Budapest* 1958 (1/2), (161–90). 18 refs. [Hu.russ.e.g.]

Reviews the climate, soils, and history of land use in this tract. Human influence, particularly the conversion of forest and pasture to arable land, is primarily responsible for the present situation, where ca. 9000 ha. are barren, eroding or actually gullied. Attempts to control erosion since 1894 are discussed; they include the more or less successful afforestation of 600 ha., and the making of dams and revetments. Recommendations are made for the proper management of forests, pasture and arable land in the basin.

459. SOURBIER, J. M. DU. Défense des sols, reboisement et restauration forestière en Chine Populaire. **[Soil conservation, reforestation and forest improvement in China.]** *Cahiers des Ingénieurs Agronomes, Paris* No. 128, 1958 (17–24). [F.] L.S.

Observations made during a 6-weeks stay in China. Points noted are the protection of loess soils by terracing and planting (largely with *Robinia pseudoacacia*), attempts to improve the management and protection of existing forests, and the establishment of Eucalypt and Poplar plantations.

460. WANG, C.-S., *et al.* **[Preliminary trials of *Pinus koraiensis* plantations in the forest massif of Tsaohokow district [Liaoning Province].]** *For. Sci., Peking* 1959 (3), (172–82). 20 refs. [Chin.russ.]

Reports results of planting 2- to 3-year-old *P. koraiensis* on bare and desert areas, the only site preparation being cutting of the grass. After planting, the areas were weeded and harrowed once or twice a year. Survival was > 85% and, at 20 years, plantation-grown trees are 6·2 times as high as those in natural stands, and their diameter 7·5 times as great. In the Changpai Shan and Little Hingan Mountains, the performance of planted *P. koraiensis* is expected to be even better than at Tsaohokow.

235. Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth

See also No. 335.

461. GREEN, A. W., and GREEN, L. **Fast-starting species best in some Iowa plantations.** *Sta. Note Cent. St. For. Exp. Sta.* No. 138, 1959. pp. 2.

When poisoned hardwood stands were underplanted with various species, Eastern Cottonwood, hybrid Poplars, and (in valley sites) Tulip Tree were promising after 4 years, despite luxuriant herbaceous growth, while slow growing species (Norway

Spruce, European Larch, Black Cherry, American Basswood and Black Walnut) failed through weed competition.

462. SCHERER, K. Die Begründung und Pflege des Kiefernmischbestandes im Hessischen Bergland. **[Establishing and tending mixtures with Pine in the mountainous part of Hesse.]** *Forst- u. Holzw.* 14 (15), 1959 (312–5). [G.]

Discusses the history of the forests; natural regeneration of Pine; advance regeneration of Beech; planting or sowing after clear-felling old conifer stands; pruning, thinning, etc.

236. Care of Regeneration or Plantations in the Initial Stages of Establishment

See also No. 257.

463. BASKERVILLE, G. L. **Softwoods respond to weeding.** *Pulp Paper Mag. Can.* 60 (8), 1959 (140, 144). 1 ref.

A further report [cf. *F.A.* 16 No. 454]. The increased rate of height growth was maintained even after the shrubs had closed in again (1953), and by 1958 had continued for 9 years with no sign of lessening. All trees ⩽ 7 ft. high at release showed this increased rate, the best relative response being in trees ca. 2 ft. high at release. Fir [*Abies balsamea*] responded earlier than the Spruce [*Picea glauca*].

464. WALDRON, R. M. **Hazel foliage treatments to reduce suppression of White Spruce reproduction.** *Tech. Note For. Br. Can.* No. 75, 1959. pp. 17. 10 refs.

Experimental plots of dense Hazel (*Corylus cornuta*) under scattered White Spruce and Aspen were sprayed in August with aqueous solutions of 2,4-D, 2,4,5-T, a 50/50 mixture of the two, or Ammate. All treatments gave a fairly complete kill of aerial parts of the Hazel and resulted in increased growth of White Spruce reproduction. It is believe that much of the released Spruce will not again be overtopped by the Hazel.

237. Amelioration of Forest Sites

See also Nos. 457, 496, 612, 1013.

465. HEIKURAINEN, L. Suometsätieteen nykyistä taustaa ja tulevia tehtäviä. **[Background and future tasks of swamp forestry.]** *Metsät. Aikak.* 1958 (11), (381–4). [Fi.]

Surveys progress in Finland, where of the 10 million ha. of wet forest land, one million have already been drained and about 5·5 million of the remainder are considered worth draining; drainage of this area should add 15 million cu.m. to annual increment in Finland. Techniques and costs, maintenance, and the need for a reliable system of site quality indices are discussed. [Cf. *F.A.* 20 No. 4538.]

466. HÄKKINEN, K. Kokeita ojitettujen soiden tuhkalannoituksella. **[Experiments on the use of ash as a fertilizer on drained swamps.]** *Metsät. Aikak.* 1958 (11), (388–9). [Fi.]

Describes experiments on the use of wood ash on drained swamps carrying Pine seedlings. An analysis of the ash, compared with Cajander's figures for the ash-constituent requirements of 1 ha. of Pine forest during an 80-year rotation, shows that 5000 kg. ash/ha. is sufficient. There was considerable variation in the results with variation in amounts of ash, below 5000 kg., used.

467. VALIKOVA, V. F. **[Use of trace elements in the afforestation of drained and exploited peat-bog soils.]** *Mikroèlementy v Sel'skom Hozjajstve i Medicine, Akademija Nauk Latvijskoj SSR, Riga* 1955 (1956), (465–70). [Russ.?] From *abstr.* in *Chem. Abstr.* 53 (11), 1959 (10624). P.R.

Experimental plots of exploited and drained peat-bogs were limed to pH 4·6–6·2, fertilized with NPK (40, 80 and 60 kg./ha. respectively), and with Mg, and supplemented with 6 kg. Cu (as $CuSO_4$), 1 kg. B (as borax), or 20 kg. Mn (as $MnSO_4$)/ha. The effect of trace elements was evaluated by determination of total weights (t.w.) of 1 + 0 Oak, Spruce and Pine seedlings. The t.w. increase for Pine seedlings compared with unfertilized controls was (i) 118, (ii) 270, (iii) 253, (iv), 269 and (v) 339% in plots receiving (i) NPK, (ii) NPK + Cu, (iii) NPK + Mn, (iv) NPK + B, and (v) NPK + Cu + Mn + B, the stimulating effect being attributed to the direct uptake of trace elements supplied and to the activation of peat decomposition by trace elements. Soil nitrification was stimulated by B, while all trace elements and Mg increased the soil content of soluble P.

468. ARMSON, K. A. **An example of the effect of past use of land on fertility levels and growth of Norway Spruce (*Picea abies* (L.) Karst.).** *Tech. Rep. Fac. For. Univ. Toronto* No. 1, 1959. pp. 10. 4 refs.

Investigation into the past history of an area of Spruce plantation established in 1945 on former farmland revealed that a small block of well-grown trees (10–14 ft. high) among the generally poor growth (2–5 ft.) was on the site of a cowshed that had been razed as long ago as 1906. The bearing of this on the duration of residual effect of fertilizing is discussed.

469. KIRSCHNER. Meliorationsversuche im Schwäb.-Fränk. Keuperbergland und auf der Ostalb. **[Soil amendment trials in the Swabo-Franconian keuper uplands and on the Ostalb.]** *Forschungsergebnisse zur Förderung der forstlichen Erzeugung, Bundesministerium für Ell/(AID), Hiltrup (Landwirtschaftsverlag)* No. 2, 1958 (43–8, 91, 94, 96). [G.g.e.f.]

Summarizes work in progress on poor sands and physically unsatisfactory (dense and waterlogged) clays with fertilizers (including NH_3 gas, and stable manure), species trials, etc., with some results to date. Conifers showed little, and hardwoods marked response to fertilizing, particularly complete fertilizing.

470. KRÓLIKOWSKI, L. Wpływ jednorazowego nawożenia mineralnego na uprawy sosnowe. **[The influence of a single application of mineral fertilizer in Pine plantations.]** *Sylwan* 102 (1), 1958 (82–93). 9 refs. [Pol.russ.f.] [Cf. *F.A.* 18 No. 410.]

471. HAUSSER, K. Ergebnisse von Düngungsversuchen zu schlechtwüchsigen Nadelholzkulturen auf Buntsandstein des württembergischen Schwarzwalds. **[Fertilizer trials on slow-growing conifer plantations on bunter sandstone in the Württemberg Black Forest.]** In *Auswertung von Düngungs- und Meliorationsversuchen in der Forstwirtschaft*. Ruhr-Stickstoff Aktiengesellschaft, Bochum. 1958. pp. 129–68. 8 refs. [G.g.]

Describes 5-year results of 5 trials in slow-growing plantations or natural thickets of Spruce, Silver Fir, or Scots Pine, where Ca alone had hardly any, Ca + P a little, and N (given at the same time or later, and particularly if repeated) a considerable effect on height growth and vigour. No clear difference between various forms of N fertilizers emerged [NH_3 was not included].

472. WITTICH, W. Auswertung eines forstlichen Düngungsversuches aus einem Standort mit für weite Gebiete Deutschlands typischem Nährstoffhaushalt. **[A fertilizer trial on a site with a nutrient balance typical of many in Germany.]** In *Auswertung von Düngungs- und Meliorationsversuchen in der Forstwirtschaft*. Ruhr-Stickstoff Aktiengesellschaft, Bochum. 1958. pp. 1–48. 17 refs. [G.g.]

Describes trials on a slightly loamy sand with raw humus, poor in N but fair in other nutrients, in the S.E. corner of the Lüneburg Heath, designed as deficiency experiments with Ca, N, P and K (given at planting and 4 times repeated). At the end of the 8th growing season, marked growth response to N in terms of height and volume was shown by all the species under trial, viz. Scots Pine, Norway Spruce, Japanese Larch and Red Oak; the two latter, while failing on control plots, outgrew the Pines in mixtures on fertilized plots. There was no significant difference between the N plots, nor much difference in the development of nutrient content in the Pines on them, but in the course of time dilution effects in respect of the deficient minerals became apparent in all species and by a comparison of relative annual growth of leaders it was possible to determine, for P and K, but not for N, the point (in time and in nutrient content) at which deficiency occurred. The biological activity of the soil improved progressively. The results are considered to prove that fertilizing is economically sound on these sites.

473. THEMLITZ, R. Umsetzung verschiedener N-Dünger mit einem durch voraufgegangene Bestandeskalkung bzw. -stickstoffdüngung umgewandelten Fichtenrohhumus. **[Decomposition of different N fertilizers in Spruce raw humus previously fertilized with CaO and/or N.]** *Z. PflErnähr. Düng.* 82 (2/3), 1958 (165–74). 9 refs. [G.g.] O.R.S.

In laboratory experiments 0·8% N in the form of (*a*) $CaCN_2$, (*b*) NH_3, (*c*) urea or (*d*) $(NH_4)_2SO_4$ was added to Spruce raw humus that was (1) otherwise untreated or from stands previously fertilized with (2) CaO, (3) $CaCN_2$ or (4) CaO + $CaCN_2$. The results were assessed after 76 and 227 days. The reaction of (1) was improved most by (*a*), and markedly also by (*b*) and (*c*). The reaction of humus that previous treatment with CaO or $CaCN_2$ had brought to pH 5–6·5 was further improved by (*a*), but the other N sources caused an ever-increasing concentration of H ions; (*a*) also improved nitrate formation in (1) more than in (2), (3) or (4), whereas (*b*) and (*c*) brought about more nitrification in previously fertilized humus, particularly in (4); (*d*) produced no nitrification in (1), very little in (3), much in (2) and (4). The amount of fixed N was not significantly increased in (1) by any N treatment but was considerably increased in (2), (3) and (4) by (*a*) and somewhat less by (*b*). Some N-fixation following treatment with (*c*) and (*d*) was found after 76 days, but was masked after 227 days by progressive nitrification. The % of non-hydrolysable N rose even without N application during the course of the experiment, but was increased most by (*a*), least by (*d*). The formation of N-rich, stable humus in previously fertilized stands was improved only by (*c*), and N incorporation was much better in (3) and (4) than in (1) and (2). Leaching of humates in (1) was increased most by (*b*), then (*a*), then (*c*); (*d*) did not influence leaching, as its acid components hindered the formation of NH_4 humates. Treatments (2), (3) and (4) reduced humus leaching to a minimum.

474. FRANZ, H. Das biologische Geschehen im Waldboden und seine Beeinflussung durch die Kalkdüngung. **[The biological processes in forest soil and the effect thereon of liming.]** *Allg. Forstztg.* 70 (15/16), 1959 (178–81). [G.]

Includes some data for the years 1955–57 from plots under Spruce in Upper Austria which had received 9 tons/ha. CaO or 20 tons $CaCO_3$ in 1952, showing changes in the fungal and bacterial flora and in the soil fauna. The number of oribatid species was greatest in the controls, smallest in the CaO plots. [Cf. *F.A.* 19 Nos. 414, 1720.]

475. RONDE, G. [and collaborators]. Bodenzoologische Untersuchungen von Stickstoff-Meliorationsflächen im Bayerischen Staatsforstamt Schwabach (Mittelfranken). **[Soil-zoological investigations of N fertilizer trials in the Bavarian forest district of Schwabach (Central Franconia).]** In *Auswertung von Düngungs- und Meliorationsversuchen in der Forstwirtschaft*. Ruhr-Stickstoff Aktiengesellschaft, Bochum. 1958. pp. 49–128. 90 refs. [G.]

Reports, in continuation of earlier research [cf. *F.A.* 20 No. 1386], on the evaluation, in 1957, of two fertilizer trials established in 1955–56 in poor Pine stands: (I) a drained bog, (II) a poor dune sand, both with raw humus. (I) received 200 kg. N/ha. (*a*) as NH_3 or (*b*) as $NH_4NO_3.CaCO_3$ with or without Ca, P or K, while (II) received (*a*) or (*b*) plus Ca, P, and K. Detailed accounts of the soil fauna are supplemented by detailed accounts of the humus (*W. L. Kubiena*), ground flora (*J. L. Lutz* and *K. Kriso*), and micro-organisms (*H. Poschenrieder* and *T. Beck*), and of experiments with insect pests (*H. Oldiges*). Effects could be seen in transformation of humus, reduction of C/N ratios, enrichment and diversification of ground flora, increase in bacteria and reduction of fungi, intensive nitrification, appearance of earthworms previously absent etc. These were generally greater on (*a*) than on (*b*)

plots, and greater where other nutrients were added. Greatest earthworm density was found on an (*a*) + Ca + P plot. This also showed the highest values in the 'reaction' and 'N-indicator' figures evolved from 'site spectra' based on ground flora [cf. *F.A.* 14 No. 29]. Effects were markedly less on (II), where mineral status and C/N ratio showed no change. There was, however, a marked increase in the % of ground covered by litter, indicative of greater needle production. When larvae of *Lymantria monacha* and *Bupalus piniarius* were fed, in 1956, on needles of the (*a*) and (*b*) plots of (II), mortality among the 1st and 2nd instars rose markedly as compared with that of 1st and 2nd instars fed on controls, mortality being highest on (*b*) plots. Pupal weights of *L. monacha* on (*a*) and (*b*), and of *B. piniarius* on (*b*) only, were also reduced. Considerable exudation of resin was noted on gnawed needles of (*b*), which had a N content of 1·78% of dry matter vs. 1·45% for (*a*).

476. CONSTABLE, D. H., and HODNETT, G. E. **The responses of *Hevea brasiliensis* to fertilizers in Ceylon.** *Emp. J. exp. Agric.* 27 (106), 1959 (150–7). 3 refs. O.R.E.

N and P evoked generally consistent responses (measured by girth), and K (in the presence of P) also evoked some response. Girth was found to be a good indicator of future short-term yield of latex.

477. HORA, F. B. **Quantitative experiments on toadstool production in woods.** *Trans. Brit. Mycol. Soc.* 42 (1), 1959 (1–14). 18 refs. O.B.D.

Plots in 3 Scots Pine plantations near Reading were dressed with: (1) 6 oz. hydrated lime/sq. yd., (2) 3 oz. superphosphate/sq. yd., (3) 3 oz. $(NH_4)_2SO_4$/sq. yd., (4) 3 oz. 'Growmore' complete fertilizer/sq. yd., and (5) 1½ oz. KNO_3/sq. yd. Counts were made of fruit bodies of agarics found in 3 successive seasons on these plots. The results are presented and discussed, with particular reference to the 3 most numerous species—*Lactarius rufus*, *Paxillus involutus* and *Omphalia maura*. It appeared that (2), (3) and (4) were very effective in stimulating fruit-body production in the first two species, while (1) had a depressing effect; (5) had a much smaller stimulating effect than (2), (3) or (4), and it is possible that nitrate N is not a suitable form of N for agarics on these soils. *O. maura*, which is normally confined to burnt ground, appeared in large numbers on (1) plots, and the relation of burning to liming is discussed.

238. Timber Plantation Crops requiring Special Treatment

See also Nos. 1282, 1291.

478. WALTER, M. Mechanisierung des Pappelanbaus und der Pappelpflege im StFB Nedlitz (Kreis Zerbst). **[Mechanization of Poplar planting and tending in the Nedlitz State forest (Zerbst district).]** *Forst u. Jagd* 9 (3), 1959 (131–3). [G.]

Describes an electric circular saw for taking cuttings from stool shoots, the use of motor cultivators, lifting ploughs, etc., with notes on costs and time saved compared with manual work.

479. BELGIOIOSO, G. B. DI. La pioppicoltura ne Lodigiano. **[Poplar-growing in the plain of Lodi.]** *Monti e Boschi* 10 (9), 1959 (475–85). [It.f.e.]

An account of the extensive plantations, with statistical data on area, increment etc.

480. Vers une politique du peuplier au Maroc. **[Towards a Poplar policy in Morocco.]** Ministère de l'Agriculture, Rabat. 1959. pp. 35. [F.]

Reviews the present status of Poplar-growing in Morocco, research in progress, and possibilities of expansion in the future.

24. Tending of Stands and Trees

See also No. 462.

242. Thinning

See also Nos. 40, 322, 336–7, 348, 822, 828, 852–4, 902–3, 1013.

481. COZZO, D. Contribución al conocimiento de la oportunidad e intensidad de raleos en bosques cultivados de *Araucaria angustifolia*. **[The frequency and intensity of thinnings in artificial stands of *A. angustifolia*.]** *Rev. for. argent.* 3 (2), 1959 (39–46). [Span.]

In order to determine the most favourable densities of stocking and the best time to make thinnings, data on diameter increment were collected by taking increment cores from trees in forests of different densities in Misiones, carrying (1) 2500–3000, (2) 2000–2500, (3) 1000–2000, (4) < 1000 trees/ha. A high initial density appears to do no harm to *A. angustifolia* and consequently initial spacings of 2 × 2, 2 × 2·5, 2·5 × 1·5, 2 × 1·7 m. etc., giving 2000–3000 trees/ha. may safely be undertaken, especially in Misiones where there is a good market for thinnings. After the 7th year, however, the stand is liable to stagnate, and a first thinning must therefore be made in the 6th year. With wider initial spacings, e.g. 2·5 × 3 m. (1333 trees/ha.), 2·5 × 2·5 m. (1600), 3 × 3 m. (1111) etc., the first thinning may be delayed until the 8th year. With still wider spacings, e.g. 3 × 4 m. (833 trees/ha.), and 4 × 4 m. (625), the first thinning must still be made in the 8th or 9th year. In (1) and (2) the first thinning must reduce the density of stocking to that of (3). For example, a stand with an average of 2500 trees/ha. must be reduced by 40% to ca. 1500. A second thinning for (1) and (2) and a first thinning for (3) and (4) must be made in the 8th year. After this initial period of growth *A. angustifolia* suddenly becomes light-demanding, and, although no experiments have yet been made to determine the times and intensities of subsequent thinnings, the fact that a plantation made in 1937 with an initial stocking of 557 trees/ha. (unthinned since), shows signs of stagnation, makes it clear that later thinnings must be very heavy.

482. DANIEL, T. W., and BARNES, G. H. **Thinning a young stand of Lodgepole Pine.** *Proc. Soc. Amer. For.* 1958 (1959), (159–63). 6 refs.

A study, covering 16 years, on the effect of thinnings on the development of b.a. and diameter structure, based chiefly on numbered residual trees

on 4 plots in the Wasatch mountains, Utah, thinned heavily, moderately, lightly, or not at all in 1938. In line with previous experience, it was found that thinning reduced total b.a. growth. Mean diameter fell rapidly with increasing stem numbers up to 2500 trees/acre, and slowly thereafter, but mean diameter of the 400 largest trees continued to fall rapidly beyond this. It is thought that in stands with $\leqslant$ 2500 stems/acre thinning could be postponed to age 45–50 without undue sacrifice of diameter increment on final crop trees. Damage by porcupines was concentrated on trees $>$ 4 in. in d.b.h.

483. RUDOLPH, V. J., and LEMMIEN, W. A. **Growth of dominant and codominant Scotch Pine crop trees following thinning.** *Quart. Bull. Mich. Agric. Exp. Sta.* 41 (4), 1959 (758–61).

In the 6 years after thinning in a 21-year stand in the Kellogg Forest, Mich., diam. growth of both dominants and co-dominants increased (1·5 and 1·0 in.) compared with unthinned controls (1·2 and 0·7 in. respectively). The unthinned co-dominants had a significantly shorter live crown length, expressed as a % of total tree height, than the thinned co-dominants. Though dominants should normally be chosen as crop trees, well formed co-dominants, which are easier to prune, may also be left.

484. GRIFFITH, B. G. **The effect of thinning on a young stand of Western Hemlock.** *For. Chron.* 35 (2), 1959 (114–33).

In 1950 a small area in young (8–22 years) uneven-aged *Tsuga heterophylla* was thinned to 6 × 6 ft. spacing of dominant and co-dominant trees, giving ca. 19·6 trees per 0·016-acre plot. A control plot was established in the unthinned part of the stand, having 76 trees on the same area. Comparison was made periodically until 1957 of number of trees, b.a., mean d.b.h. and mean height on thinned and unthinned plots, and also a detailed study of radial and b.a. growth of individual trees in relation to weather etc., and the data are set out and discussed in detail. Response to thinning was particularly marked in the first 3 years, during which b.a. of thinned trees increased at about 4 times the rate of control trees. Total b.a. of the thinned stand is expected to equal that of dominants and co-dominants on the control plot 10 years after thinning. In each of the years 1954, 1955 and 1956, the growth of the Hemlock trees started during the first week of May and ended during the last week of September or the first week of October. There was no significant difference in duration of growing period between thinned and unthinned trees, but in each of the 3 years under study the 18 thinned trees grew twice as fast in b.a. as the 9 controls.

485. CONOVER, D. F., and RALSTON, R. A. **Results of crop-tree thinning and pruning in northern hardwood saplings after nineteen years.** *J. For.* 57 (8), 1958 (551–7). 12 refs.

These results extend those given after the first 8 years of the study [see *F.A.* 10 No. 1054]. Non-commercial thinning in 1938 removed all trees within 2½ or 5 ft. of selected crop trees, and in 1946 extended these radii to 5 or 7 ft. respectively. Bd. ft. volume was definitely best on the heavier thinning (1369 bd. ft./acre compared with 846 bd. ft. on unthinned control plots). The total volume in cords after 16 years was greatest on unthinned plots, but 54% of it was in non-crop trees, whereas 86% of the total volume on the heavier thinning was in crop trees. Dominant Sugar Maple remained dominant or co-dominant regardless of treatment. On the heavier thinning, 46% of intermediate trees were dead or suppressed after 16 years. Epicormic branching was general after the 1946 pruning and thinning on all species except White Ash, but by 1957 most of the epicormics had disappeared, except in intermediate and suppressed trees. Low forks were much more frequent in the thinned plots, 65% of the Elm in the more heavily thinned plot forking below 25 ft., compared with 38% on the control plots. It is too early to evaluate fully the long-term results of the increased growth of crop trees after thinning, or the adverse effects on quality.

486. ARMĂŞESCU, S., and DECEI, I. Contribuţii la cunoaşterea caracteristicilor dendrometrice ale arboretelor de salcîm. (Rezultate din instalarea unor suprafeţe de probă permanente.) [**The dendrometrical characters of Robinia stands: results obtained from a permanent sample plot.**] *An. Inst. Cerc. Silv., Bucureşti* (*Ser. I*) 19, 1958 (133–49). 11 refs. [Rum.russ.g.]

Preliminary findings are reported from permanent sample plots established in 1955–56 in Robinia stands (plantations and coppice) of different ages. In medium (B-grade) thinnings, the % of trees removed was double the % of basal area removed. The % removed by selection thinning as practised by the Bucharest Forest Research Station was intermediate between that for C- and D-grade thinnings. It was shown that, for any one thinning grade, the % of growing stock removed, alike in respect of b.a., volume, and number of trees, was not significantly influenced by site quality class, and that this % remained constant for stand density 1–1·2.

243. Opening of the Canopy (Increment Fellings, Overhead Release and Improvement Fellings)

See also Nos. 348, 461, 640.

487. PLASS, W. T., and GRETH, J. W. **Cutting practice demonstrations in upland hardwoods [with discussion].** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 162, 1959. pp. 13. 1 ref.

Describes 3 methods of cutting—(1) rehabilitation, (2) heavy commercial and (3) merchantability-limit—applied to mixed-hardwood and Oak/Hickory sites as a result of recommendations made in 1948 for converting unmanaged to managed forest [cf. *F.A.* 11 No. 221], and compares in histograms and tables the changes that had begun to appear by 1956 in vol., b.a., composition, and quality, in favour of method (1) where all cull trees were eliminated and desirable regeneration encouraged.

488. TRUMAN, R. **Tree poisoning.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 11 (4), 1959 (10–5).

[Cf. *F.A.* 20 No. 4576.] Reviews the merits of various chemical and growth-regulator-type

herbicides as tree poisons, and discusses various methods of treatment used in New South Wales and the U.S.A.

489. PEEVY, F. A. **Methods of applying herbicides for controlling individual weed trees.** *Forests & People, Alexandria, La.* 9 (3), 1959 (31, 42–3).

Results from recent tests in Louisiana show that injection of 2,4,5-T (12–20 lb./100 gal. diesel oil) at the base of a tree, using a tree injector, though slightly more expensive than poison girdling, is safer and gives better sprout control. For Red, Post, Blackjack and White Oaks, holes should be spaced 2 in. apart for trees < 9 in. diam. and 1 in. apart for trees > 9 in. For species more difficult to kill (Sweet Gum, Black Gum, Elm, Willow, Water Oak, and Hickory) the corresponding spacing should be 1 in. and ½ in. Fenuron was rather more effective than monuron as a soil-injection treatment during late winter and spring to kill Post and Blackjack Oaks. They were effective when applied round the base of trees either as a finely ground powder or mixed in water at concentrations of 8 and 16 lb./100 gal. Good kill was obtained with fenuron at ½–1 g./in. of stem diam. The cost was ½–¾ cent per in. of diam.

245. Tending of Trees, Pruning etc.

See also Nos. 368, 485.

490. GORDON, D. T. **Ten-year observations on pruned Ponderosa and Jeffrey Pine.** *Res. Note Pacif. Sthwest. For. Range Exp. Sta.* No. 153, 1959. pp. 4. 2 refs.

A re-examination, after 10 years, of the effects of pruning *Pinus ponderosa* and *P. jeffreyi*, substantiated the 5-year conclusions [see *F.A.* 18 No. 1614]. Up to half the live crown, or $\frac{6}{10}$ of total height, can be pruned away without significantly affecting the growth rate of either species. No trees died after 50% or lighter pruning. Observable insect activity was concentrated in the early years after treatment, the only recent activity observed being a single dead leader, killed in the 9th year. Pruning is not recommended as a means of keeping porcupines out of the trees, since, contrary to general belief, it was found that they can and do climb pruned trees without branches for 20–30 ft. from the ground.

491. LOGAN, K. T. **Some effects of pruning on White Pine seedlings.** *For. Chron.* 35 (2), 1959 (109–11). 2 refs.

Experiments were made with 5- and 10-year-old *Pinus strobus*, treatments being (*a*) all branches pruned except top two whorls, (*b*) all branches pruned except top whorl, (*c*) all branches pruned, terminal and lateral buds left, (*d*) all branches pruned, only terminal bud left, and (*e*) untreated control. To maintain the treatment condition, the lowest whorl of branches was removed each spring for 3 successive years. Measurement after 3 years showed that (*a*) seedlings were substantially the same as (*e*) in height, branch length, needle length, and diameter of leader; (*b*) and (*c*) were ca. 1 ft. shorter, their branches ca. 3 in. shorter, and leader diameters ca. 2 mm. less; (*d*), which had no branches, was the same height as (*b*) and (*c*) but leader diam. was ≥ that of (*e*).

492. **Bud pruning Slash Pine.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1958*, 1959 (62–3).

Bud pruning in a stand planted in 1948 and pruned 3–4 times a year since 1950 until pruning reached 17 ft., resulted in poor growth and poor form [cf. *F.A.* 16 No. 1748; 18 No. 2854].

493. ARBONNIER, P. Produits chimiques—sylviculture et reboisement: L'utilisation des auxines pour l'élagage artificiel. [**The use of chemical substances in silviculture and afforestation: The use of growth regulators for artificial pruning.**] *Rev. for. franç.* 11 (8/9), 1959 (605–9). 4 refs. [F.]

Reviews work done so far in this field [cf. *F.A.* 19 No. 432; 20 No. 4580].

25. Treatment of Defective, Derelict or Very Open Stands

See also Nos. 332, 461.

494. STEFANELLI, A. Studio sulla situazione attuale dell'abetina di Pontebba (Alto Friuli Orientale). [**The present state of the Spruce /Fir woods of Pontebba in Alto Friuli.**] *Monti e Boschi* 10 (6), 1959 (249–64). [It.f.e.]

Describes this communal forest (mainly Spruce and Silver Fir, with a mixture of broadleaved species), which has suffered from unscientific selection felling. Stand volume has been reduced to 124 cu.m./ha., and regeneration is excessively dense in some places and totally lacking in others. Some remedial measures are suggested.

26. Combinations of Forestry with Agriculture and Pastoral Husbandry. Irrigated and Floodland Forests, Shelterbelts etc., and their Treatment

261. Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land

495. COLE, R. **Temiar Senoi agriculture: a note on aboriginal shifting cultivation in Ulu Kelantan, Malaya. Part 1.** *Malay. Forester* 22 (3), 1959 (191–207 + 6 photos).

Describes the social organization and mode of life of these aborigines; factors of site selection, methods of preparation and farming, together with accompanying rites, are discussed. In Part 2 (to be published later) the system of shifting cultivation in use will be described and conclusions drawn. *From author's summary.*

262. Fuel and Fodder Forests

See No. 328.

263 Irrigated Forests. Forests subjected to Flooding or Seepage (*Auewald*)

See No. 306.

264. Farm Forests

496. SCHWARZ, R. Schauversuchsflächen für forstliche Standortssanierung. [**Demonstration trial plots for forest site amelioration.**] *Allg. Forstztg.* 70 (17/18), 1959 (196–7). 5 refs. [G.]

In degraded farm forests on mountain sites in Upper Styria, trial plots established by sowing or

planting various conifers and hardwoods simultaneously with lupins, after removing the raw humus layer by bulldozer and subsequent liming [cf. *F.A.* 18 No. 1491] showed excellent growth after 4 or 5 years.

497. **The raising and planting of trees on the farm.** *Rhod. agric. J.* 56 (3), 1959 (91–105). E.M.B.

Presents (1) information on nursery practice, choice of site and species, planting and tending, and (2) brief notes on 24 species (both hardwoods and conifers) suitable for S. Rhodesia.

265. Strips or Lines at Road, Rail and Canal Sides etc.; Hedgerow Trees

498. TÓTH, B. Az öntözörendszerek fásítási kérdései. [**Afforestation of [the spoil embankments created by digging] irrigation canals.**] *Erdész. Kutatás., Budapest* 1958 (3/4), (181–205). 1 ref. [Hu.russ.e.g.*russ.g.*]

Discusses the problems involved, and describes the root systems of *Robinia pseudoacacia* planted on such embankments. The following afforestation procedure is recommended: excavating the top soil separately, and then spreading it on the graded and levelled embankment; green manuring, fertilizing, and soil inoculation; contour furrowing to prevent run-off; and the use of pioneer tree species on poor soil. Besides *R. pseudoacacia*, the species *Elaeagnus angustifolia*, *Quercus borealis*, *Populus* × *marilandica*, *P. alba*, *P.* × *robusta* and *P. canescens* are recommended as main species, and 17 other tree and shrub species are listed as being suitable in mixtures with them. The importance of using species that do not spread readily by seed or suckers is stressed, since many areas, for reasons of management of the irrigation system, need to be maintained clear of tree growth.

266. Shelterbelts, Windbreaks

499. CABORN, J. M. **Shelterbelts.** *Scot. Agric.* 39 (1), 1959 (199–202). O.R.E.

A general discussion, with particular reference to Scottish conditions, citing examples of shelterbelt establishment in Scotland especially between 1720 and 1850, the benefits to stock and crops, and the grants now available for planting.

500. RHEE, J. A. VAN. Windbeschutting van cultuurgewassen, vooral onderzocht voor fruit. [**Protection of crops, especially fruit, against wind.**] *Meded. Inst. Toegep. Biol. Onderz. Nat.* No. 43, 1959. pp. 66 + 5 tbls., 2 photos. 46 refs. [Du.du.e.]

Data from the Netherlands over several years on the effect of shelter on yields and growth of fruit trees, strawberries, green vegetables, cereals and potatoes, are given in graphs and tables. Early-flushing trees with broad crowns, that will stand pruning (e.g. *Populus simonii fastigiata* and *P.* × *berolinensis*) are recommended as orchard windbreaks. [Cf. *F.A.* 19 No. 4215.]

501. LUPE, I. Z., *et al.* Cercetări privind tehnica de creare a culturilor forestiere de protecţie a cîmpului în R.P.R. (perioada 1937–1955). [**Studies on the establishment of shelterbelts for the protection of field crops in Rumania 1937–55.**] *An. Inst. Cerc. Silv., Bucureşti* (*Ser. I*) 18, 1957 (96–169 + 1 tbl.). 46 refs. [Rum.russ.f.]

Reviews, with illustrations, the findings of a number of studies that have been published separately, and a certain amount of unpublished material.

502. CATRINA, I. Regimul umezelii solului sub perdelele de protecţie din Cîmpia Bărăganului. [**The water balance of soils under shelterbelts on the Bărăgan plain.**] *Rev. Pădurilor* 74 (7), 1959 (384–8). 10 refs. [Rum.russ.g.f.e.]

On the basis of his own studies (1956–58) in the brown chernozem zone of the Bărăgan Plain, the author establishes the water balance of this soil in general and of its variants under shelterbelts, forest stands, grass and arable.

503. OTA, I., *et al.* [**Meteorological investigation in the nursery (No. 2).**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 105, 1958 (149–62). 7 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 16 No. 4003.] Gives similar data for various points in a nursery enclosed by typical dense shelter-hedges of *Chamaecyparis obtusa* 3 m. high and 1 m. wide. Reduction of wind velocity and evaporation, and increase in air and soil temperatures (measured in spring and autumn with N. winds) was greatest at twice hedge height, becoming nil at 16 heights to leeward. At 5 heights to windward, wind velocities and evaporation were both increased.

268. Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.

See also No. 34.

504. KAMINAGA, T., YOKOYAMA, C., and MATSUZAKI, S. [**Sheep grazing on Larch-planted land.**] *Extr.* from *Ann. Rep. For. Exp. Sta., Hokkaido 1956*, 1959 (22–38). 11 refs. [Jap.e.*e.*]

Studies were made in stands planted 1 and 2 years earlier with Larch at the rate of 3000/ha.; growth was poor because of clayey, wet soil, and mean heights were 48 and 55 cm. *Artemisia gigantea* predominated in the ground layer, with other herbs and grasses common on farm land, at various seasons. Sheep were grazed in 2 fenced areas of 600 sq. m. in spring and summer or in spring and autumn respectively. Spring grazing was at the density of 51 sheep, and summer and autumn grazing at 33 sheep per 0·1 ha. Tabulated data show the composition of available forage on the fenced areas at various seasons, the injury to Larch seedlings by browsing and trampling, and the weight % of stems, leaves and heads of 4 of the tall fodder species and the proportion of each eaten. The % of Larch seedlings damaged by the sheep was 16·8 and 27·7% in spring, 35·3% in summer, and 17·5% in autumn; grazing %s for the corresponding periods were 77 and 66%, 39%, and 56%. Sheep should be excluded from Larch plantations until seedlings reach a height of 1·2 m., to prevent damage to the terminal shoots.

27. Arboreta. Arboriculture for Ornamental Purposes. Hedges and Hedge Plants

See also No. 216.

505. CHYLARECKI, H. Cisy w Arboretum Kórnickim i ich właściwości dekoracyjne. [**Yews in**

the Kórnik Arboretum and their decorative properties.] *Arboretum Kórnickie, Poznań* No. 3, 1957/1958 (5–34). 37 refs. [Pol.e.russ.]

The Arboretum contains 3 species, 1 hybrid and 25 varieties of Yew. Their frost-hardiness or otherwise is discussed and 9 species and varieties considered especially decorative are mentioned.

506. BROWICZ, K., and BUGAŁA, W. Rzadkie drzewa i krewy w Arboretum Kórnickim. **[Rare trees and shrubs in the Kórnik Arboretum.]** *Arboretum Kórnickie, Poznań* No. 3, 1957/1958 (49–69). 13 refs. [Pol.e.russ.]

Including *Pinus armandii* and *Albizzia julibrissin*, with notes on growth rate, flowering, frost hardiness etc.

507. POHL, Z. Buki w Arboretum Kórnickim. **[Beeches in the Kórnik Arboretum.]** *Arboretum Kórnickie, Poznań* No. 3, 1957/1958 (35–47). 23 refs. [Pol.e.russ.]

The Arboretum contains 6 species of *Fagus*, and 7 varieties of *F. sylvatica*. Their rates of growth, behaviour, frost-hardiness, etc. are discussed, and on this basis the author recommends trial plantings of *F. orientalis* and *F. grandifolia* as forest trees in Poland; the other exotic species and the *F. sylvatica* varieties may be of value as ornamentals. [Cf. *F.A.* 21 No. 357.]

28. Husbandry of Forest Products Other than Wood

283. Fruit and Seed Crops etc.

See Nos. 1246, 1296.

284. Crops Tapped for Exudations etc.

See also Nos. 312, 476.

508. OSTROM, C. E., TRUE, R. P., and SCHOPMEYER, C. S. **Role of chemical treatment in stimulating resin flow.** *For. Sci.* 4 (4), 1958 (296–306). 12 refs.

Exploratory physiological experiments were made on the effect of applying 40–60% H_2SO_4 to tree wounds, and data are given and discussed on the relative rates of exudation of *Pinus palustris*, *P. elliottii* and *P. taeda*; the vertical spread of the response to stimulation; the effect of H_2SO_4 applied to the phloem; and the anatomical effects from H_2SO_4 applied to normal wounds penetrating the cambium. To determine how chemical stimulation works, two comparable groups of 10 trees were wounded every 12 hours for 11 days in July with a wound 6 in. wide, ½ in. high and ½ in. deep, so that resin was drained faster than it was synthesized. One group was sprayed with 50% H_2SO_4, the other group left untreated. The total resin yield from the acid-treated group (7817 g.) was not significantly higher than that from the untreated group (7661 g.). The findings indicated that acid does not stimulate the actual resin production of the tree but simply facilitates the flow by prolonging the time during which resin ducts remain open after wounding. [Cf. *F.A.* 20 No. 536.]

509. PEJOSKI, B. Komparativni smolarski ogledi na crniot i beliot bor vo Mariovskite šumi (1953 i 1954 godina). **[Comparative studies of resin-tapping on *Pinus nigra* and *P. sylvestris* at Mariovo (1953–54).]** *God. Zborn. Zemj. Šum. Fak. Univ. Skopje* (*Šum.*) No. 10, 1956/1957 (17–125). 19 refs. [Maced.f.*f.*]

In 1953–54, 4 methods of tapping were tried on a total of 3941 *P. nigra* in Macedonia, viz. the French method (*a*), and American faces, (*b*) 18 cm. wide, (*c*) 10 cm. wide, using 40% H_2SO_4 as a stimulant on both, and (*d*) 10 cm. wide but without 40% H_2SO_4. Two methods were applied to 791 *P. sylvestris*, viz. the German (face 18 cm. wide) with and without 40% H_2SO_4. Though for *P. nigra* (*a*) gave the highest yields per sq. cm. of face, the total yield from (*c*) was 17% higher, since 5000 faces were tapped per season (10-day freshening cycle) vs. 3000 (4-day cycle) for (*a*); but (*b*) is recommended as the most profitable method, particularly for tapping to death, over a 10- to 12-year period. For *P. sylvestris* (*b*) is also recommended. While 40% H_2SO_4 proved satisfactory for *P. sylvestris*, trials should be made of a 50% concentration on *P. nigra*. A linear relationship was established between d.b.h. and resin yield, the yield increasing with d.b.h. [cf. *F.A.* 19 No. 3025].

510. ĆURČIĆ, M. Upotreba stimulatora pri smolarenju crnog bora na području Semegnjevske Gore. **[The use of stimulants in tapping *Pinus nigra* in the region of Mt. Semegnjevska, [S.E. Serbia].]** *Šumarstvo* 11 (3/4), 1958 (223–30). [Serb.]

Shows resin yields in 1949–53 from 85,000 faces, using in different years French and German faces and a local method beginning at a height of 3 m. and working downwards [not further described]. In 1954–56, a 25% concentration of HCl and $CaCl_2$ was applied and a comparison of the maximum annual yields (*a*) with and (*b*) without stimulants (in 1952 and 1956) showed that for (*a*), while the area of face decreased by 35%, resin yield per unit area increased by 85%. Stimulants thus allow tapping for longer periods. The number of trees tapped per season per worker rose to 3000 for (*a*) as compared with 2000 for (*b*).

511. NIKOLIĆ, S. Neka aktuelna pitanja smolarenja u NR Srbiji. **[Some tapping problems in Serbia.]** *Šumarstvo* 11 (7/8), 1958 (424–37). 18 refs. [Serb.e.f.]

A plea for the systematization of tapping procedures in Serbia. Recommendations are made on methods of determining the allowable number of faces per stem, their spacing, and the duration of tapping.

512. KAMIŃSKI, E., and SZMIT, B. Przecinanie pasów życiowych w jednorocznym obiegu jako sposób podwyższenia efektywności żywicowania. **[Cutting through the interspaces in a single season's freshening as a method of increasing resin yields.]** *Sylwan* 102 (1), 1958 (48–59). 7 refs. [Pol.russ.e.]

Presents tabulated data for several hundred Scots Pine trees, showing that cutting a single [German] face right round trees (already carrying German faces) increases the resin yield up to 8%

and is a useful practice in the year before trees are felled.

513. Ostrowski, W. Próba opracowania tablic wydajności balsamicznej żywicy sosnowej dla drzewostanów w Gdańskim Zarządzie Lasów Państwowych. [**Tentative tables for the resin yield of Scots Pine stands in Gdańsk state forests.**] *Sylwan* 103 (4), 1959 (55–70). 18 refs. [Pol.russ.e.]

Presents tentative data, with graphs and tables, of the yield per tree by mean d.b.h. and Schwappach's site classes, over a 2- and a 3-year tapping period (1955–57), based on 1971 plot records involving a total yield of nearly 3 million kg. Yields per tree averaged from 3·78 kg. for site class I to 2·89 for II, for a 2-year tapping period with ca. 70 freshenings per season, and from 3·65 to 2·52 kg. for a 3-year period with ca. 50 freshenings per season.

514. Januško, A. D., and Levin, B. M. Effektivnost' podsočki prispevajuščih sosnovyh nasaždenij. [**Tapping immature Pine stands.**] *Gidrol. lesohim. Prom.* 11 (6), 1958 (24). [Russ.] P.R.

A comparison made in Belorussia of the resin yield of (*a*) mature and (*b*) immature (70- to 75-year) stands of Scots Pine, from data collected in 1955 on 6517 ha. of (*a*) and 1166 ha. of (*b*), showed that the average yields per face were 20–30% lower for (*b*) than for (*a*).

515. Šaternikova, A. N. Sostojanie podsočennyh sosnovyh nasaždenij na srednem Urale. [**The condition of tapped Pine stands in the central Urals.**] *Gidrol. lesohim. Prom.* 11 (5), 1958 (10–2). [Russ.] P.R.

Healthy Pine trees, 90–100 years old, on good sites, tapped to a height of 3·7–4·15 m. with faces 22–30 cm. wide (covering 50% of the stem) and 7–11 mm. deep, showed no noticeable weakening after 9–10 years' tapping; but when 60–70% of the stem was tapped, with faces 38 cm. wide and 15 mm. deep, deep cracks appeared after 7 years' tapping, the cracks showing red and blue stain. Mortality and dieback were appreciably higher in a 140- to 160-year-old tapped stand.

516. Kinastowski, S. Wpływ żywicowania na fizyczne i mechaniczne własności drewna sosny pospolitej. (Doniesienie tymczasowe). [**The influence of resin tapping on the physical and mechanical properties of Scots Pine wood. (Provisional report).**] *Sylwan* 103 (6/7), 1959 (31–7). [Pol.russ.e.]

Tapping appeared not to affect density and, if continued for > 2 years, increased compression strength $\|$. It was difficult to determine any influence of tapping on static bending and impact strength. Lengthening the tapping period reduced tensile strength $\perp$, and more so for heartwood than for sapwood. Tapping for $\leqslant 3$ years reduced the hardness of the butt wood more than that at $\frac{1}{3}$ height.

517. Učenyj sovet CNILHI po voprosam podsočki eli. [**A symposium of CNILHI on tapping Spruce [in Russia].**] *Gidrol. lesohim. Prom.* 11 (5), 1958 (28–9). [Russ.] P.R.

Includes a very brief report of papers on: The prospects of tapping Spruce (*A. I. Kalninš*); An intensive tapping method in the year of felling (*A. K. Tolkačev*) [see *F.A.* 16 No. 3032]; Experiments in tapping Spruce (*V. G. Štanagej*) [experiments in which bark, but not cambium, was removed from 600 trees under the intensive tapping method (see above) gave yields of 564 g./tree during the tapping season. Under commercial conditions, yields were only 318 g./tree, the disparity being explained by the shortage of trained personnel]; The technology of Spruce resin preparation, properties of its products, and use of Spruce resin for balsam preparation (*N. A. Gurič*).

286. Osier-Growing

518. Ruffer, H. Maschinelle Korbweidenernte. [**Mechanical harvesting of Osiers.**] *Forst u. Jagd* 9 (3), 1959 (141–3). [G.]

Various tools are described, including electric circular saws, adaptations of the Družba power saw having a circular blade instead of a chain, and cutters adapted from mowing machines for use with garden cultivators or tractors.

3. WORK SCIENCE (WORK STUDIES). HARVESTING OF WOOD: LOGGING AND TRANSPORT. FOREST ENGINEERING

30. Work Science (Work Studies): General

519. **Proceedings of the meeting of the Section 32 [of I.U.F.R.O.]: Operational Efficiency, in Stockholm, 30 August–3 September, 1958.** Forest Research Institute, Stockholm. 1959. pp. 138.

Includes the following papers (languages indicated in brackets): Dynamic work organization in forestry (*H. H. Hilf*; [G.]); The practical use of physiological research methods in work study (*N. P. V. Lundgren*; [E.]); Work analysis (*P. Aro*; [G.]); Experience in carrying out field studies laid out on mathematical-statistical principles (*H. Steinlin*; [G.]); Work studies in forestry: time studies without correction to normal work output (*K. Kilander*; [E.]); The analysis and practical application of the time-study material in Sweden (*K. Kilander*; [E.]); Modern methods of time and motion studies (*G. Kaminsky*; [G.]); The mechanical barking of pulpwood in connection with hauling as practised in Sweden (*A. Burenius*; [E.]); Peculiar characteristics of forest communications (*J. Klemenčič*; [G.]); Calculation of the optimum road network in the forest (*G. Larsson*; [G.]); Transport of whole trees by long-distance cableways (*H. Steinlin*; [G.]); The principal technical and economic criteria for planning the forest road network (*K. Matyáš*; [G.]); Technical and economical views on the importance of concentrating logging operations (*A. Staaf*; [E.]); The road enumeration of the Swedish national forest survey (*G. von Segebaden*; [E.]).

303. Training in Work Science and Efficiency

See also No. 1288.

520. Goodwin, J. F., and Betterton, S. J. **Are your workers effectively trained?** *Quart. J. For.* 53 (3), 1959 (206–9). 3 refs.

Discusses the need for training workers quickly, for planning the work and the instruction, 'on-the-job' training, advanced training for experienced workers, and safety publicity [cf. *F.A.* 20 No. 4616].

304. Hygiene. Safety; Accidents and their Prevention

See also Nos. 1017, 1085.

521. Lutta, A. S. Individual'naja i gruppovaja zaščita ot gnusa. **[Individual and group protection from biting flies.]** *Lesn. Prom.* 1959 (8), (9). [Russ.]

A short account of the use of Soviet insecticidal creams and dusts to give protection to forest workers, both on the job and in woods camps.

307. Tools, Equipment, Machines and Working Animals: General

See also Nos. 372–3, 380, 383, 417, 436, 438–9, 451–3, 478, 518, 679.

522. **Equipment section.** *Unasylva* 13 (2), 1959 (106–8).

Specifications and photographs of: the Prentice Hydraulic loader (Heikkinen Machine Co., Prentice, Wis.) [can be installed on any standard lorry]; Motorola Handie-talkie Pocket Receiver and Transmitter (Motorola Inc., Chicago); Grenmulder (Abildgaardens Frugtplantager, Bistrup, Denmark) [crushes twigs and branches up to 4–5 cm. in diam., with working depth 10–12 cm. according to the soil; drawn by a medium-sized tractor and operated by the tractor driver]; Bombardier Muskeg Tractor—Model H.D.W. (Bombardier Snowmobile Ltd., Valcourt, Quebec); Jet-Dozer Log Pond Boat (John Manly Ltd., New Westminster, British Columbia) [steel boat specially built for sorting and moving individual logs or bundles in mill ponds, dumps and booming grounds; jet-propelled]; Shawnee Log Grapple (Shawnee Mnfg. Co., Topeka, Kansas) [side-mounted on tractor, working over front of tractor with operator in normal driving position]; Portable Metal Detector Cintel (Rank Cintel Ltd., Sydenham, London).

31. Logging and Transport: General

See also Nos. 519, 812, 1245.

523. Lussier, L. J. **A statistical planning system for control of logging operations. [With discussion.]** *For. Prod. J.* 9 (6), 1959 (192–5).

Describes the methods of operational research, including the collection of time-study data by appropriate sampling, and their statistical analysis, leading to the construction of a mathematical model which can be applied in making rational managerial decisions (duration of operations, number of tractors to be employed, logging system etc.) and in control of performance.

524. Krzeszkiewicz, S. Quelques observations sur l'organisation de l'exploitation forestière en pays tropical. **[The organization of logging in tropical countries.]** *Bois For. Trop.* No. 66, 1959 (29–40). [F.c.span.]

Stresses the importance of preliminary surveys.

323. Felling and Subsequent Primary Conversion

See also Nos. 529–45, 817.

525. Morariu, T. Înălțimea minimă a cioatelor pe suprafețele în pantă. **[Computing the minimum height of stumps on sloping ground.]** *Rev. Pădurilor* 74 (4), 1959 (225–8). 5 refs. [Rum.russ.g.f.e.]

A theoretical computation of the height at which trees growing on a slope should be felled when designed to fall (*a*) uphill, (*b*) along the contour, (*c*) downhill, for slopes of 10, 15, . . . 45°.

526. Strehlke, B., and Peine, J. Baumfällen mit Wagenheber. **[Felling trees with lorry jacks.]** *Forst- u. Holzw.* 14 (13), 1959 (283–5). 1 ref. [G.]

[Cf. *F.A.* 19 Nos. 1795, 4245.] Describes and illustrates the use of hydraulic jacks in felling Spruce and Beech of up to 3 cu.m., all leaning well away from the direction of felling. A 5-ton jack was able to do the job, but it is thought wiser to have a 10-ton model in reserve for larger trees.

33. Degree of Utilization and Waste. Clearing the Felling Site. Harvesting of Small Wood. Salvage Fellings

See also No. 1076.

527. Schultz, L. G. **Utilization of logging and sawmill waste in Gippsland, Victoria [with discussion].** *APPITA, Melbourne* 13 (1), 1959 (18–21).

Discusses the practice of the Australian Paper Manufacturers, Ltd., of arranging roughly concurrent operations for timber and pulpwood harvesting in *Eucalyptus gigantea* forests. Pulpwood is salvaged from the logging waste (tops and defective butts) left after the timber logging operations, and from defective living trees. In addition, the slabs left after converting the sawlogs, which were previously burned, are now being chipped and provide a valuable extra source of pulpwood.

528. Roff, J. W., and Eades, H. W. **Deterioration of logging residue on the British Columbia Coast (Western Hemlock, Amabilis Fir, and Sitka Spruce).** *F.P.L. tech. Note For. Prod. Lab. Can.* No. 11, 1959. pp. 38. 10 refs.

In a pathological study of the deterioration of logging residue, salvageable for pulpwood, data were recorded on a total of 750 pieces (minimum length 8 ft., minimum diam. 6 in.) remaining on sample plots near Port McNeill and Sandspit, British Columbia. At yearly intervals the subsequent occurrence of decay was noted, with causal organism and extent, and quantitative results were derived following stem analyses of selected pieces. The rate of deterioration in all areas was similar, increasing rapidly in the second year after logging to a maximum rate between the second and third years and decreasing annually thereafter. During the first three years, decay losses amounted to $> \frac{1}{2}$ the net volume: Sitka Spruce was more, and Amabilis Fir less resistant than Western Hemlock. In

Western Hemlock decay was mainly of the brown cubical rot type, in Sitka Spruce white rot was more prevalent, while in Amabilis Fir both types were about equal in importance. Deterioration of residue was affected by retention of bark and position of pieces relative to the ground, the ocurrence of ambrosia-beetle infestations and of decays which originated in the standing tree, and also by the length of material and the solar exposure. *From authors' summary.*

34. Storage of Wood in the Forest and at Log Dumps ('Landings')

See Nos. 752, 1115, 1130–2.

35. Performance Measurements for Determining Piece Rates in Felling and Related Operations

See also Nos. 519, 531, 538.

529. Benić, R. Utvrđivanje normalnog učinka rada kod obaranja i izrade jelovine u ljetnoj sjeci. **[Determining normal performance in felling and converting Silver Fir in summer.]** *Šum. List* 82 (11/12), 1958 (369–90). [Croat.g.]

Time studies were made of the felling, barking, trimming and cross-cutting of 235 trees on a 20% slope at Gorski Kotor, Croatia. The basic unit of time per stem and per assortment is shown, with allowances for variation in tree branchiness and ground slope. A 20% allowance for pauses etc. is recommended. Formulae are given for the correlation established between stem d.b.h. and the time taken per operation.

36. Tools, Machines and Equipment for Felling and Related Operations

See also Nos. 518, 519, 522, 526, 545, 1019.

530. Kantola, M. Näkymiä koneellistamisrintamalta. **[Some aspects of mechanization of forest work.]** *Metsät. Aikak.* 1958 (11), (359–60, 363). [Fi.]

Reviews the extent of mechanization in Finland during the past decade, indicating the size of the increase in number of power saws, barking machines, mechanical loaders, tractors etc.

531. Putkisto, K. Puun korjuutöiden koneellistuminen ja metsätalouden työvoiman tarve. **[Mechanization of timber harvesting [in Finland] and forest labour requirements.]** *Metsät. Aikak.* 1959 (6/7), (236–8). [Fi.e.]

Includes some data on the expenditure of man-hours/cu.m. in felling and transport and on the % of felling, barking and cross-cutting done mechanically.

532. Schilling, W., and Groh, R. Die Mechanisierung auf Holzausformungsplätzen. Technologische Untersuchungen auf Ausformungsplätzen der Deutschen Demokratischen Republik. 1. Teil. **[Mechanization of primary conversion after extraction. Technological investigations on landings in E. Germany.]** *Suppl.* to *Forst u. Jagd* 8 (12), 1958. pp. 10. 2 refs. [G.]

Discusses methods of mechanized cross-cutting, and transport (including loading) to and from conversion sites in the forest or at the railway station, including data based on time studies and physiological work studies on 18 landings.

533. Transportable barkmaskiner. **[Portable barkers.]** *Inform. Skogbr. Skogind. ForsknForen.* (*Transportutv.*) No. 82, 1959. pp. 5. [Nor.]

Describes 3 categories: (1) with the friction parts mounted on a revolving ring (e.g. the Cambio 35 T), (2) with cutters pressed against the rotating log, and (3) on the 'Valo' principle [see *F.A.* 16 No. 3062] where the log passes through a double ring of barking spuds. Lists manufacturers, technical data and prices for 10 Scandinavian models.

534. Andrenko, A. P. Modernizacija motopily 'Družba'. **[Modernizing the Družba power saw.]** *Lesn. Prom.* 1959 (7), (14–6). [Russ.]

The new features in the saw [cf. *F.A.* 16 No. 4139] are designed mainly to reduce vibration and weight.

535. Domnick, H. Einmannsäge—Einmannfällung. **[One-man saw—one-man felling.]** *Forst u. Jagd* 9 (3), 1959 (139–40). 4 refs. [G.]

Includes an illustrated description of a hydraulic wedge shown at the Agricultural Exhibition in Moscow in 1958, which can be attached to a Družba power saw. Sawing and wedging can proceed simultaneously. The wedge is controlled by a lever on the saw handle.

536. Szepesi, L. A motorfürészek alkalmazásának egyes problémái. **[Some problems in using power saws.]** *Erdész. Kutatás., Budapest* 1958 (3/4), (105–26). 18 refs. [Hu.russ.e.g.*russ.g.*]

Discusses the relative merits of petrol and electric power saws from several countries, with brief specifications, and also Hungarian performance data for some of the saws.

537. Akiho, S., Ishii, K., and Takatoi, K. **[Field test of the felling and bucking operation with one-man chain saw. (On the felling and bucking of Hinoki and Sawara in Kiso national forest.)]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (143–63 + 30 photos). 6 refs. [Jap.]

Tests were made with McCulloch and Homelite chain saws.

538. Zeitstudien mit Motorsägen. **[Time studies with power saws.]** *Holz-Kurier, Wien* 14 (28), 1959 (7). [G.]

Briefly summarizes studies in Austrian forests. Power-saw times in conifer stands varied from 5% of total working time for diameters of < 10 cm. to 17·5% for those of 30–34 cm. In the conversion of sawlogs, felling took 25, trimming 36, and cross-cutting 22% of the power-saw time, the rest being chiefly maintenance. With the small dimensions, power saws took longer than hand saws; time saved was greatest (28–29%) in the 20–30 cm. class. Mean power-saw time for Beech was 17% of total working time, and resulting savings ca. 30% of sawing time for all dimensions. With operating costs for a power saw (assuming a life of 5 years and 1750 operating hours) at Sch. 18/hr. and mean wages ca. Sch. 9/hr., introduction of power saws would necessarily be slow where labour was plentiful. [Cf. *F.A.* 19 No. 4254.]

539. **Saw files and filing.** *For. Equipm. Note, FAO* No. *D.*22.59, 1959. pp. 7.

Describes and illustrates types of file used for different types of saw and saw tooth, and methods of sharpening different types of saw. Includes a short glossary of terminology and a list of file names.

540. SINGH, S. N. **Maintenance of cross-cut saws.** *Indian For.* 85 (9), 1959 (564–71 + 12 photos). 1 ref.

Deals also with bow-saws, and describes maintenance of both triangular-toothed and raker-toothed saws.

541. SILVERSIDES, C. R. **Catalogue of portable wood chippers.** *For. Equipm. Note, FAO* No. *D. Cat.* 2, 1959. pp. 27. [E.F.]

Gives specifications, prices, and name and address of manufacturer, for 54 chippers.

542. STREHLKE, B. Holzhackmaschinen für die Zerkleinerung von Reisig und Erzeugung von Holzschnitzeln für die Industrie. **[Wood chippers for the comminution of brushwood and for the production of chips for industry.]** *Forstarchiv* 30 (15), 1959 (182–4). 5 refs. [G.]

Discusses the main types and uses, and lists specification data and prices for 9 light machines (for field and forest use) and 5 heavy ones (for industrial use) of German, Austrian, English and American manufacture.

543. STOLPE, N. **Water-borne chipping station.** *Finn. Pap. Timb.* 10 (3), 1959 (36–7). [E.]

Describes, with illustrations, equipment used since 1958 by Oy Kaukas Ab in the archipelago of Lake Saimaa to make possible the use of small wood from Pine and Spruce thinnings from the company's forests, most of which are accessible only by water. The station consists of a steel barge, 29 × 7 m., carrying a barking machine (Model Cambio 21, capacity 60 linear m./min.), an ARI chipper powered by Bolinder diesel, conveyors for loading wood from the shore and the necessary driving machinery. Regulation of the contents of water tanks fore and aft allows the barge to be brought close inshore and kept steady. The ARI chipper is used for the preparation of pulp chips, and the barge carries another small chipper for chipping (for fuel) logs unfit for pulpwood. Fuel chips and pulp chips are blown into separate storage barges. The crew (a foreman and 4 men in 1958, though a smaller crew will be used in 1959) live in a house-boat. The quality of the chips obtained was quite satisfactory but it is too early to assess costs. It is hoped to harvest at least 15,000 cu.m. of logs for chipping in 1959 and to use the station as long as conditions permit.

544. JEWUŁA, E. Ocena przydatności obracaków do pracy. **[Assessment of the suitability of cant hooks, peavies, etc.]** *Sylwan* 103 (3), 1959 (92–7). [Pol.russ.e.]

Reports the results of tests on eight different types of Polish hooks (some already used in practice, others prototypes) from the point of view of speed, efficiency and safety of work.

37. Transport

372/377. Land Transport

See also Nos. 519, 522, 530–2, 812, 879.

545. KNIGHT, W. T. **Experimental work in pulpwood harvesting [with discussion].** *APPITA, Melbourne* 13 (1), 1959 (11–7).

An account of work done in Victoria: (1) with wire-mesh timber chutes (wire 0·3 in. diam., mesh 9 × 1½ in.) for billet extraction in otherwise inaccessible country; (2) on transporting billets by gravity cableways; (3) with a Drott loader on a crawler tractor for hauling and loading pulpwood billets (with tabulated performance data); (4) with the Slashmobile, a docking saw mounted on the front of a pneumatic-tyred tractor, to cut 6-ft. billets; (5) with the 'Hargans portable billeter', for converting logs that cannot be split economically by hand; this has two independently powered, traversing circular saws set at 90° to each other (45° either side of vertical) and mounted in a tubular frame.

546. STOŠIĆ, D., and POPOVIĆ, B. Mogućnosti smanjenja troškova utovara i istovara drveta. **[Possibiities of reducing expenses of loading and unloading wood.]** *Šumarstvo* 12 (1/2), 1959 (29–35). [Serb.g.]

Works out mathematically the theoretically possible saving in expenditure in loading and unloading (*a*) by a better organization of work under present conditions [details not given], and (*b*) by introducing mechanization.

547. NAIDU, K. K. **Integrated mechanization of timber extraction in the Andamans.** *Proc. 4th World For. Congr., Dehra Dun 1954*, Vol. 2, 1957 [1959], (543–58 + 8 photos). 11 refs. [E.]

The principal feature of mechanized logging in the Andamans is its composite nature i.e. a careful integration of elephants with tractors, Wyssen cableways etc., the elephants being used e.g. for skidding from stump to loading place, for loading and unloading tractors or trains etc.

548. SCHRANK, M. Ergebnisse beim baumweisen Rücken von Nadelholz. **[Results in full-tree skidding of conifers.]** *Forst- u. Holzw.* 14 (15), 1959 (318–20). [G.]

Discusses experience in the Lübeck area with full-tree skidding by tractor under several different sets of conditions. In each case the trees were skidded to a conversion point for trimming, sometimes barking, and for stacking by assortments. Data are given on the volume of wood handled per hour, the assortments obtained, and the wages earned, when working: (*a*) in a sparse stand of 40-year Norway Spruce (mean stem 0·14 cu.m.) completely windblown; (*b*) in clear-felling and stump-grubbing a similar but not windblown stand; (*c*) in clear-felling 1 ha. of 48-year Sitka Spruce (mean stem 0·5 cu.m.); (*d*) in thinning 5 ha. of 80-year Norway Spruce (mean stem 0·6 cu.m.). The method was particularly suitable for (*a*), and also for clear-felling in cases where it was desired to plough the whole site after logging.

549. **I. Lasso motor winch. II. Radio-controlled towing winch.** *For. Equipm. Note, FAO* No. *C*.29.59, 1959. pp. 2.

(I) Operated by a 9-h.p. petrol engine, this new winch, manufactured by Câble-Lasso-France, St. Quentin, has no drum but, instead, a V-shaped pulley drive like that of a capstan. There is no limit to the length of cable used. Total weight is 130 kg., cable speed 18 m./min. for a pull of 2000 kg. It can be either clamped to a tree or mounted on a lorry or tractor. (II) See *F.A.* 20 No. 4663.

550. KAUFMANN, J. Viszonyainknak megfelelö erdögazdasági csörlö szerkesztése. **[Design of a winch suitable for forest conditions in Hungary.]** *Erdész. Kutatás., Budapest* 1958 (3/4), (139–45). [Hu.russ.e.g.]

Assuming skidding distances > 500 m. and max. loads of 1·5 cu.m., a universal winch of the following type is proposed: 2-drum; capacity of each drum 500 m. of 9-mm.-diam. cable; working load of smaller drum 1500 kg.; power source 8-h.p. petrol engine. Such a winch is already being built by the Institute of Forest Sciences.

551. URIN, JA. M. Novye serijnye mašiny. **[New mass-produced machines.]** *Lesn. Prom.* 1959 (6), (5–8). [Russ.]

Describes, with specifications and drawings, the L-43 winch for stacking timber, and the P-6 and P-12 winch-operated tipping platforms for timber lorries.

552. BEGEMANN, W. Das Bringen von Fichten-Stammholz mit Anbau-Seilwinde im direkten Zug. **[Direct winching of Spruce logs with a tractor-mounted winch.]** *Forst- u. Holzw.* 14 (15), 1959 (320–1). [G.]

A brief description of equipment, method and costs, in skidding the wood to a lorry road.

553. PESTAL, E. Von der Bodenrückung zum Seiltransport. **[From ground skidding to transport by cable.]** *Allg. Forstztg.* 70 (7/8), 1959 (92–7). [G.]

Discusses cable skidding on the ground, both uphill and downhill, and short-distance skyline cranes, including models by Hinteregger and de Pretis (Carinthia), Wimmer (Salzburg), and Huber (Bavaria) which can manage downhill transport up to 800 m.; also winches suitable for this with the right braking action, skid-mounted models being preferred. Developments in long-distance skyline cranes are described, with particular reference to the Wyssen carriage. An oil pump operated by one of the wheels of this carriage feeds oil into a small cylinder fitted with a small outlet pipe, and connected to a piston pressing on a spring. While the carriage is in motion, the oil pressure prevents the piston from moving, but as soon as the carriage stops, oil ceases to flow in but continues to flow out, so that pressure is lowered and the spring operates the piston, which in turn activates the clamps and releases the operating cable. [The carriage is stopped by the operator at the winch.] A 5-ton and a 2-ton model are being manufactured.

554. GIORDANO, G. **Logging cableways.** [*Publ.*] *FAO/ECE Jt. Comm. Working Tech.* No. *FAO/ECE/LOG*/60, 1959. pp. xi + 145 + 121 photos & dgms. [E.] Price $1.25 (9*s.*, or *Sw.Fr.*5).

Describes the role of cableways in forest exploitation, gives an account of the main existing types, and examines the problems of installation and operation, including costs and depreciation.

555. GIORDANO, G. Einige praktische Neuerungen für den Betrieb mit forstlichen Seilbahnen. **[Some new devices for the operation of forest cableways.]** *Allg. Forstztg.* 70 (13/14), 1959 (153–7). [G.]

Describes (*a*) the teleferometer, a geometrical instrument developed by the author for the measurement of cable tensions, and (*b*) cable supports enabling the direction of the cable to be changed by 4°. Both these devices will be included in a forthcoming publication, of the Centro Nazionale del Legno, Firenze, on the theory and practice of cableways in Italy.

556. **1. Control recorder 'Controlographe'. II. 'Le Mouchard' operation control recorder.** *For. Equipm. Note, FAO* No. *B*.18.59, 1959. pp. 2.

I. [Cf. *F.A.* 17 No. 2837.] II describes a similar meter for fitting to cars, lorries etc. to record length of running time, stops etc.

557. HAKKARAINEN, A. E. Traktoriperävaunujen kuormittaminen. **[The load of tractor trailers.]** *Tied., Metsäteho, Helsinki* No. 159, 1959. pp. 11. [Fi.e.*e.*]

Presents the regulations [for Finland], introduced in 1957, for loads of timber carried on public highways. Tabulated figures show examples of permissible loads for different combinations of tractor and trailer. [Cf. *F.A.* 19 No. 3081.]

558. KISTENFEGER, J. Die MAN-Schlepper 40 und 50 PS im Forsteinsatz. **[The 40- and 50-h.p. MAN tractors used for forestry.]** *Forstarchiv* 30 (7), 1959 (143–4). [G.]

Gives technical details and assesses practicability, including notes on construction, parts and accessories. Results of tests in soil cultivation and winter extraction in mountainous terrain are described briefly, and for summer extraction in hilly conditions, mean hourly and daily performance and mean speed (in two sets of conditions) are shown. Both models gave satisfactory results.

559. PARFENOV, G. M., and RUDENKO, M. N. O prjamoj vyvozke lesa traktorami. **[Direct extraction of wood by tractors.]** *Lesn. Prom.* 1959 (8), (6–7). [Russ.]

Investigations showed that transport of tree-length logs to a broad-gauge railway was more efficient and economical by S-80 crawler tractors [cf. *F.A.* 20 No. 602] than by narrow-gauge railway or lorries. After discussion of the tractors' speeds of travel under load, and their load per trip, formulae for calculating the amount of work done per tractor shift are presented. In direct extraction for distances of 1, 3 and 6 km., the output per tractor-shift is 70–100, 50–65, and 36–45 cu.m. respectively.

560. MAGIROVSKIJ, N. P. Novye trelevočnye traktory. **[New skidding tractors.]** *Lesn. Prom.* 1959

(7), (17–20 + 1 dgm.). [Russ.]

Describes some modifications to the TDT-40 [cf. *F.A.* 19 No. 1827], and gives the specifications of the TDT-49 crawler tractor.

561. FUJIBAYASHI, M., KATO, S., and OKAWARA, S. **[Some field tests of the logging tractor 'Fordson'.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (143–55). [Jap.e.*e.*]

As a result of field tests, develops a formula for calculating maximum possible load to be handled on a given slope:

$$W = \frac{M(\mu \cos\theta - \sin\theta)}{\mu' \cos\theta + \sin\theta},$$

where W = maximum load (in koku) to be hauled with skidding pan, M = total weight of tractor and winch in kg., θ = slope in degrees, μ = coefficient of adhesion, and μ' = coefficient of skidding resistance.

562. **I. Radisson tractor; II. Nodwell Transporter.** *For. Equipm. Note, FAO* No. *C.*28.59, 1959. pp. 2.

(I) Description, specification and photographs of the tractor, which is constructed in two separate units, one with the running gear and the other a frame upon which the engine and controls are mounted. (II) Specification and photograph of the transporter, designed for use in muskeg, mud, and snow. Manufacturer Bruce Nodwell Ltd., Calgary, Alberta.

563. DUNNE, J. F. **Timberland Timberskidder.** *Pulp Paper Mag. Can.* 60 (7), 1959 (176, 178).

Specifications and performance data of a 4-wheel-drive tractor (Timberland Machines, Woodstock, Ont.). The net dynamometer h.p. is 170 at 3500 rev./min., and the automotive rating is 220 h.p. at 4400 rev./min. The tractor has 10 forward and 4 reverse speeds, and is fitted with a winch. In skidding tree-length logs it averaged 25·24 cords/day for 36 days, with a mean skidding distance of 1000 yards. Max. production when skidding unbundled wood was 35·4 cords/8-hr. day, loads averaging 1·25 cords. In an experiment with bundled wood, a rate of 51 cords/day with average loads of 1·87 cords was attained. The machine performed quite well in 3 ft. of snow, but its performance under more severe summer logging conditions is as yet unknown.

564. GENGE, G. A. **Clark Logger—final report.** *Pulp Paper Mag. Can.* 60 (7), 1959 (168 . . . 174).

The Clark PL-75 Pulpwood Logger was developed and tested for several years as an off-road prime mover, to handle 4-ft. wood piled at stump. Details are given of the performance of the machines, including detailed cost analysis, for 1958–59, and, following the modifications proposed earlier, the machine is now considered an acceptable operating unit.

565. STIGLIANI, R. Rotaie nella foresta. **[The use of light railways in the forest.]** *Monti e Boschi* 10 (9), 1959 (463–74). [It.]

Describes the use of light (Decauville) railways for the extraction of timber in the Calabrian Apennines and the State Forest of Gorgano.

378. Water Transport

See also Nos. 522, 543, 888.

566. PUTKISTO, K. Puutavaranippujen siirto Atron ja Puntarikosken voimalaitoksilla. **[The moving of timber bundles at the Atro and Puntarikoski power plants.]** *Metsät. Aikak.* 1959 (5), (181–94). [Fi.e.*e.*]

Describes, with illustrations, equipment used to lift bundles over or past the dam to the lower water basin, giving data on crews needed, working efficiency, costs etc. [Cf. *F.A.* 14 No. 3446.]

567. VASIL'EV, A. V. Koėfficient zapolnenija reki pri distancionno-gruppovom sposobe splava. **[The 'coefficient of loading' of a river [with timber] when [loose] floating by the method of spaced-groups.]** *Lesn. Prom.* 1959 (5), (24–5). 1 ref. [Russ.]

A theoretical discussion, showing how to calculate the coefficient from the duration, frequency and volume of launchings from a boom of given length.

568. KOLBASKO, V. D., and STALINSKIJ, A. E. Plot s hlystami poverhu. **[A raft with tree-length logs on top.]** *Lesn. Prom.* 1959 (8), (10–1). [Russ.]

Describes in detail the construction of a 4-section bundle raft (465 × 52 m., draught 1·8 m., volume 26,717 cu.m.), having tree-length logs (only 1·9% of total raft volume) on top. Less tackle and labour were required per unit of volume to make this raft than other conventional types. While being towed across the Kama and Kuibyshev reservoirs, the raft withstood winds of strength 4–7 for long periods without damage, and its performance was considered satisfactory.

569. SINJAVIN, A. Morskie ploty iz hlystov. **[Sea-going rafts made of tree-length logs.]** *Lesn. Prom.* 1959 (8), (12–3). [Russ.]

Five twin-section rafts (design described and illustrated) of bundled tree-length logs were made for the Astrakhan-Gurev run (Caspian Sea, 513 km.) in 1957, and 8 in 1958. Bundle dimensions were: draught ≯ 1·5 m., length 15–20 m., width 3–4 m., volume 40–80 cu.m. Raft volumes varied from 836 to 1432 cu.m. (1957 data). One raft withstood winds of force 7–8 for 52 hours with only a little damage and no wood losses, and the rafts behaved quite satisfactorily in winds of force 6 with waves 1·5 m. high. Rafting proved cheaper than barge transport (15·98 vs. 17·58 roubles/cu.m. wood), and the tree-length log-bundle raft was cheaper to make, handle, and dismantle than the conventional local type of raft, the Astrakhan *košma.*

570. PETERSON, O. Studier över flytbarheten hos obarkat virke, som vattenlagts vintertid. **[Studies on the buoyancy of unbarked timber launched in [late] winter [and stored in water for 6 months].]** *Uppsats. Instn. Virkeslära K. Skogshögsk., Stockh.* No. 20, 1958. pp. 70 + 16 tbls. 41 refs. [Sw.sw.e.]

The material (1062 Pine and Spruce logs) was stored in water, completely submerged from March to May and floating in a ring-boom from June to Sept. 1956. As a measure of buoyancy, density was determined on 5 dates through the floating period.

Density after water storage proved to be correlated positively with that before storage, with the reciprocal of the top diam., and with the width of the last 10 annual rings, and negatively with the heartwood content. Calculations of the sinking risk, accepting a figure of 975 kg./cu.m. as the limit of buoyancy, were made for various heartwood contents and top diams. The results, not necessarily generally applicable, are shown in graphs. They suggest that unpeeled green timber of either species, with a heartwood volume content > 45% will not sink in 6 months' floating and that Spruce with top diam. > 20 cm. and Pine with top diam. 25–30 cm. are unlikely to do so; the effect of top diam. is rather greater for Spruce than Pine. Top logs are more likely to sink than butt logs, but when heartwood content and top diam. of top and butt logs are equal the difference is much reduced.

571. KENNEDY, R. J. **Pipe boom.** *Pulp Paper Mag. Can.* 60 (8), 1959 (152).

It is suggested that boom sticks built up from lengths of commercial metal pipe or tubing would be as effective as, and more economical than, existing wooden or welded metal booms. Suggested designs are given for a typical glance or guide boom, and for a holding boom, made of tubular metal.

572. KOKOREV, V. I. Plastinčatyj gasitel' skorostej tečenija. [**A plate-type current-reducer.**] *Lesn. Prom.* 1959 (7), (21–2). [Russ.]

Describes and illustrates the design of a wooden current-reducer for floating depots, consisting essentially of a single plate fixed to booms and suspended across the river below the water level. Plate sizes and depths most suitable for different current speeds are given.

573. NERATOV, P., BAHAREV, P., and BUDAROV, B. Neispol'zovannye rezervy na pogruzočno-razgruzočnyh rabotah. [**Greater efficiency possible in loading and unloading [boats].**] *Lesn. Prom.* 1959 (8), (14–7). [Russ.]

Reviews methods and equipment used in various parts of the U.S.S.R. in crane loading (from bank and water) and unloading of timber, and the scope for increased efficiency and mechanization.

574. BOGATYREV, G. A. Kater s lebedkoj dlja formirovanija i remonta plotov. [**A boat, fitted with a winch, for making and repairing rafts.**] *Lesn. Prom.* 1959 (6), (15–6). [Russ.]

Describes briefly, with plans and specifications, the T-81 motor-boat (length 17·3 m.) fitted with a 5-ton winch.

575. MURAŠKO, A. I. Paketnaja pogruzka lesa v suda. [**Loading bundles into boats.**] *Lesn. Prom.* 1959 (8), (17–8). [Russ.]

Describes, with specifications, the floating Ganz [Hanz?] Hungarian cranes used at Stalingrad for loading bundles of 6–7 cu.m. into boats, and the organization of work, using cranes working in pairs.

383. Roads and Bridges

See also No. 1251.

576. MARKO, J. Dimenzovanie vozoviek na lesných cestách metódou DORNII. [**Determining the dimensions of the carriage-way in forest roads by the DORNII [Soviet Road Research Institute] method.**] *Lesn. Čas.* 5 (3/4), 1959 (223–43). 19 refs. [Slovak. russ.g.]

Describes the method, the basic value in which is the modulus of deformation. This is expressed by the magnitude of the specific loading at which the road undergoes a certain amount of deformation (the amount being different for different types of roads).

577. DAHLFORS, B. Stickvägar för hästtransport på barmark. [**Spur roads for horse transport on bare ground.**] *Skogen* 46 (15), 1959 (304–5, 310). [Sw.]

Studies were made in 1958 on the time taken in clearing and levelling spur roads (for the purposes of the study, roads passable by horse and cart on unfrozen ground, 2 m. wide on straight stretches, rather more on bends) on terrain classified as (1) easy (few or no stones), (2) normal (fairly stony to stony and with some wet patches), and (3) difficult (stony and uneven, with spur-road construction doubtfully economic). The work was divided into various operations, and the distribution of time by operation is shown in graphs. On (1) and (2), branch removal (removal of old logging waste and of branches from living trees) took 1·2 min./10 m., or 70 and 67% of the total time respectively, stump removal 26 and 24%, and stone removal and other levelling 4 and 9%. Total time for (3) was 36·0 min./10 m. road, 3·4% for branch removal, 59·6% for levelling (filling in, stump removal and manual stone removal) and 37·0% for blasting.

578. VINOGRADSKIJ, A. A., and SYROMJATNIKOV, S. A. Opyt himičeskoj obrabotki gruntovoj odeždy avtodorogi. [**A trial in chemical treatment of earth-surfaced lorry-roads.**] *Lesn. Prom.* 1959 (7), (8–11). [Russ.]

An experimental length of earth roadbed (1 km.; 6 m. wide) was loosened by rotary cultivator to a depth of 15 cm., and sprayed with furfural/aniline (1: 2·5) as a stabilizing agent. This required 10·7 metric tons of aniline and 4·5 of furfural. The surface was graded and rolled, and metallurgical slag was then spread 4–5 cm. deep and sprayed with bitumen (ca. 8 tons) and immediately covered with a thin sprinkling of sand. In the autumn after construction, the roadway stood up well to the transport of ca. 30,000 cu.m. of wood by heavy lorries. Details are also given of the making of a cement/earth road. Acid soils should be neutralized by liming, and then Portland cement at a rate of 5–6% is worked into the loosened surface soil, moistened and rolled, and the whole given a bitumen coat and a layer of fine chippings or slag. Roads of cement/earth cost less to build than furfural/aniline-treated earth roads, and these less than prefabricated reinforced concrete ones [cf. *F.A.* 19 Nos. 4317–8].

579. KREBS, E. Der Versuch einer Kalk-untergrundstabilisierung. [**Stabilization of the road**

bed with lime.] *Schweiz. Z. Forstw.* 110 (9), 1959 (617–26 + 8 photos). [G.g.f.]

Describes a small-scale trial on a highly plastic, difficult soil with a high clay and silt fraction, using sand and ground lime, and remarking on the spectacular drying effect these additions had on a substrate which rain and unsuccessful attempts at compacting had turned into a quagmire.

580. Bossavy, J. Évacuation des eaux sur les routes forestières: un nouveau matériel. [**A new method of carrying off surface water from forest roads.**] *Rev. for. franç.* 11 (7), 1959 (551–6). [F.]

Describes a kind of sectional metal grille that can be placed over a concrete conduit across forest roads in the mountains at points where slow or unequal melting of snow prevents the usual soak-aways from functioning. Costs of material and installation are given.

581. **Trakmat**. *For. Equipm. Note, FAO* No. *B*.19.59, 1959. pp. 1. [Cf. *F.A.* 20 p. 327 (Great Britain).]

385. Drainage, Irrigation, Sedimentation. Water Supply

See No. 465.

4. FOREST INJURIES AND PROTECTION

See also Nos. 1, 324.

582. Hramcov, N. N. Bor'ba s vrediteljami i boleznjami lesnyh nasaždenij v SSSR. [**Control of pests and diseases of forests in the U.S.S.R.**] *Repr.* from [*Proc.*] *IX Meždunarodnaja Konferencija po Karantinu i Zaščite Rastenij ot Vreditelej i Boleznej, Moskva* 1958. pp. 12. [Russ.]

A brief general account, given by the Soviet delegation at the IX International Conference on Quarantine and the Protection of Plants against Pests and Diseases. It covers the distribution of pests and diseases, prophylactic measures, control measures, and research work.

41. General Technique of Forest Protection. Types of Injury

See also Nos. 629, 1151.

583. Silver, G. T. **Individual differences in estimating defoliation**. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (3), 1959 (3).

Ocular estimates were made by 5 men on degree of defoliation of Douglas Fir, (*a*) of current foliage and (*b*) total defoliation, and the data were analysed statistically. One-third of individual averages for (*a*) and one-ninth of those for (*b*) exceeded plot averages by ± 5%. It is concluded that, on the whole, visual estimates are sufficiently accurate for assessing stand condition.

42. Injuries from Inorganic Agencies other than Fire

421. Air Currents

584. Wojda, M., and Zaborski, S. Szkody wyrządzone przez huragan w dniu 17.I.55 r.na terenie leśnictwa Piekiełko w Górach Bystrzyckich. [**Hurricane damage on Jan. 17th, 1955, in Piekiełko forest in the Góry Bystrzyckie.**] *Zesz. nauk. Szkoł. Gospod. Wiejsk. Warsz.* (*Leśn.*) No. 2, 1959 (43–56 + 1 map). 7 refs. [Pol.g.russ.]

An account of the damage caused by a storm in which wind speed at times reached 30 m./sec. Factors contributing to the severe damage were: the presence of large clear-felled areas, pure plantations (Spruce), and delayed thinnings in the older stands.

422. Temperature Influences. Frost. Heat. Drought

See also Nos. 215–7, 261, 270.

585. Bollmann, X. Frostschadenverhütung durch Frostschutznebelkörper auch im Forst? [**Prevention of frost damage by artificial fog in forestry?**] *Forst u. Jagd* 9 (3), 1959 (138–9). [G.]

Suggests the use of fogging tubes filled with an [unspecified] chemical which smoulders for 40–45 min., producing enough dense fog to prevent radiation frost over 2–3 ha. The tubes, of which 1 or 2 are required per ha. per night, should be placed < 10 m. from the area to be protected, in order to avoid phytotoxic effects.

586. Białobok, S. Uszkodzenia mrozowe korzeni drzew i krzewów w szkółkach kórnickich w zimie 1955/56 r. [**Frost damage to the roots of trees and shrubs in the Kórnik nurseries in the 1955–56 winter.**] *Arboretum Kórnickie, Poznań* No. 3, 1957/1958 (179–203). 8 refs. [Pol.e.russ.*e.*]

Tabulates and discusses data on frost injuries to the root system of nursery seedlings [age not stated] of forest trees and many fruit trees. *Betula verrucosa, B. japonica, Tamarix caspica* and some *Populus* spp. were the only species to escape injury entirely. *Fraxinus excelsior, Quercus robur, Acer* spp., *Tilia cordata* and *Ulmus* '*campestris*' were among those damaged. Older trees of these species suffered less damage.

587. Bugała, W., and Chylarecki, H. Szkody mrozowe wśród drzew i krzewów Arboretum Kórnickiego wyrądzone w czasie zimy 1955/56 r. [**Frost injuries to trees and shrubs in the Kórnik Arboretum in the winter of 1955/56.**] *Arboretum Kórnickie, Poznań* No. 3, 1957/1958 (111–77). 25 refs. [Pol.e.russ.]

The min. air temperature recorded was −26·8° C. The damage caused is discussed at some length for many native and exotic species. It was noteworthy that young *Metasequoia glyptostroboides* suffered no serious damage.

588. Eder, H., and Witkowska, L. Wpływ zimy 1955/56 na wielkość szkód mrozowych w Arboretum Lasów Doświadczalnych SGGW w

Rogowie. **[Frost damage in winter 1955–56 in the Rogów Arboretum of Experimental Forests of the SGGW [Agricultural University of Warsaw].]** *Zesz. nauk. Szkoł. Gospod. Wiejsk. Warsz. (Leśn.)* No. 2, 1959 (57–82). 21 refs. [Pol.g.russ.]

Discusses the climate during that winter, compares it with the 1928–29 winter, and lists the plants damaged.

589. WHITESELL, C. D. **Stem girdling by ice.** *Tree Plant. Notes* No. 35, 1959 (28).

Describes damage caused to 2-year Virginia Pine seedlings, which were completely girdled at ½–1 in. above the ground. Ice had formed round the stems of trees growing in small depressions and wind action caused the seedlings to rub against the ice.

590. OLSEN, S. Isskurede træer. **[Ice-abraded trees.]** *Bot. Tidsskr.* 55 (1), 1959 (1–22). 11 refs. [Dan.e.] O.B.D.

Unusually high water level in early spring of 1958 caused conspicuous ice damage to the bark of trees along the shores of Tystrup-Bavelse Sø [Denmark], particularly on shores exposed to westerly or north-westerly winds. On 14 of the trees examined, the upper edge of the scars was found at heights of $1{\cdot}2 \pm 0{\cdot}2$ m. above the summer water level. Ice-damaged trees and shrubs were also observed on other lakes in the same region. Bark abrasion is the most common form of damage, but overturned, leaning and broken stems, and loosened roots have also been found. No economic loss is involved, because the trees are of no value. Their subsequent development varies widely. *From author's summary.*

591. SIMPFENDORFER, K. J. **Deadtop and rainfall.** *For. tech. Pap. For. Comm. Vict.* No. 1, 1959 (13–7). 1 ref.

Analysis of meteorological data for 23 years and the occurrence of 'dead top' of Radiata Pine in Victoria [cf. *F.A.* 19 No. 1864] leads to the following tentative conclusions: (*a*) the condition is unlikely to occur in years of ⩾ average rainfall or in years of severe drought; (*b*) it appears to be most likely to occur where the average rainfall is *slightly* below average each year for a period of at least 1½ years.

592. CEUCA, G., *et al.* Studiu privind condiţiile de vegetaţie ale arboretelor de pin cu fenomene de uscare. **[A study of growth conditions in Pine stands showing signs of dieback.]** *An. Inst. Cerc. Silv., Bucureşti (Ser. I)* 18, 1957 (203–49). 18 refs. [Rum.russ.f.]

Investigation of a number of stands demonstrated that the cause of dieback was moisture deficit, which normally occurs when the stand reaches the pole stage (the period of maximum water consumption) but which occurred earlier in some cases as a result of the droughts of 1945 and 1950.

593. DAY, W. R. **Observations on Eucalypts in Cyprus. Root development in relation to soil conditions.** *Emp. For. Rev.* 38 (2), 1959 (186–97). 5 refs.

Illustrations are presented which show the type of development in depth of the central part of the root system of *Eucalyptus rostrata* or *E. gomphocephala* in soils on which trees have suffered from gumvein development, infestation by *Phoracantha semipunctata*, or drought. It is suggested that, because of a variety of conditions which are to be found in the physical or chemical nature of the soils, the basic deficiency lies in an inadequate supply of water. This becomes critical at different levels for trees of different sizes. *From author's summary.*

423. Precipitations

594. CIUMAC, G. Aspecte în legătură cu influenţa grindinei asupra vegetaţiei lemnoase. **[The effect of hail damage on woody vegetation.]** *Rev. Pădurilor* 74 (1), 1959 (32–5). 4 refs. [Rum. russ.g.f.e.]

The author investigated damage caused by a severe hailstorm in July 1958 in the Stalin forest district to Silver Fir, Spruce, Willow (*Salix caprea*), Birch (*Betula verrucosa*) and Beech, in both young and old stands.

424. Soil Conditions. Erosion Effects. Nutrient Deficiencies etc.

See Nos. 237–9, 637.

425. Chemical Influences (Atmospheric)

595. MAŘAN, B. Odumírání smrkového jehličí působením popílku. **[The death of Spruce needles due to air-borne ash.]** *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 5 (6), 1959 (647–66). 9 refs. [Cz.cz.russ.g.]

Tabulates, for Spruce, extensive data on the weights of deposits of air-borne impurities (per unit weight of needles), the ash content of these deposits, and the SO_3 content of this ash. Gives also the ash content of the needles and the SO_3 content of this ash, with the reservation that it is very difficult to make a clear and accurate distinction between the ash and SO_3 contents of the impurities and those of the needles. The data cover dry and wet weather, and different directions and distances from the source of pollution (a coal-burning electricity-generating plant). Similar data, though less in scope and detail, are given for Pine, Larch and 5 broadleaved species. The two types of damage caused by these deposits are discussed, viz. physical blocking of the stomata, and the breakdown of chlorophyll in the leaf by the action of S compounds.

596. OKANOUE, M. **[On an injury to Akamatsu (*Pinus densiflora* Sieb. et Zucc.) forest in the vicinity of the smelting works at Hitachi.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 105, 1958 (141–7). 3 refs. [Jap.jap.e.e.]

Describes injuries to foliage of young stands, attributed to an accidental heavy release of gases from a works 1–3 km. distant in conjunction with a temperature inversion. The stands, established 1–5 years earlier, had never before suffered injury and the anti-pollution equipment had been considered adequate.

43. Forest Fires

431. Predisposing Factors and Causes. Fire Danger. Fire Behaviour

597. INOUE, K., and MASUDA, H. **[On the control [of] fires in Hokkaido (2).]** *Extr.* from *Ann. Rep.*

For. Exp. Sta., Hokkaido 1956, 1959 (15–21). 9 refs. [Jap.e.*e.*]

[Cf. *F.A.* 16 No. 3102.] Presents tabulated figures for the 1954 fire season (April–June) showing temperature, rainfall and humidity, the number of outbreaks per day and per month, and the relation between fires and the colour of moisture-indicator papers. Day-to-day fire risk is probably related to pressure distribution.

598. WILLIAMS, D. E. **Fire season severity rating.** *Tech. Note For. Br. Can.* No. 73, 1959. pp. 13. 9 refs.

From an analysis of a large number of small-scale test fires, a fire-severity factor for each class of fire danger was developed: Nil = 0, Low = 0·2, Moderate = 1·0, High = 4, and Extreme = 12. To find the fire season severity rating for an area, the severity factor for each fire-danger class is multiplied by the number of days in the fire season falling into that class; the whole is totalled, and divided by the number of days in the fire season. A few of the many practical applications of the severity rating are briefly described. It can be used to compare the potential severity of fire seasons year by year, in one area, or between different areas. When it is plotted with actual fire data, an indication of the effect of factors other than fire weather can be assessed. The severity rating can also form the basis for further and more detailed studies. *Author's summary.*

599. BERG, A. B., and LOWRY, W. P. **Fire weather studies on Bald Mountain.** *Res. Note Ore. For. Lds. Res. Cent.* No. 39, 1959. pp. 59.

A weather observation network consisting of 11 stations established in the area surrounding Bald Mountain Lookout in the Coast Range of Polk County, Oregon, reveals that the weather station at the lookout does not adequately represent the complex weather pattern in the Bald Mountain area. Observations of temperature, relative humidity, fuel moisture, and wind on east and west slopes at intermediate elevations and in the Valsetz Basin, tend to disagree with the weather station on Bald Mountain. Observations in local areas tend to agree. Descriptions of 5 selected individual days during the 1955 fire season based on an analysis of the values of the potential temperature, the mixing ratio, and the wind, reconstruct the local weather patterns in the Bald Mountain area. The study illustrates the problems the fire weather forecaster and the forester in fire control face in interpreting weather data. *From authors' summary.*

600. SCHROEDER, M. J., and COUNTRYMAN, C. M. **Fire-weather survey can aid prescribed burning.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 21, 1957. pp. 10.

A prescribed burning arranged for 29 August, 1956, in the Lassen National Forest, California, enabled the preparation and carrying out of a fire-weather survey, the specific aims of which were to: (1) provide details of daily temperatures, r.h., and wind conditions over the site; (2) explore the possibility of adopting this type of survey method for use on running fires; (3) develop sampling methods and instrumentation; and (4) measure the effect of fire on local winds. Data on wind directions and speeds collected in the 3 preceding days were analysed, and the predicted winds for the burn area were plotted on a small map. It is concluded that: (i) the surveys may be misleading unless the interaction between the fire itself and relevant weather elements is considered; (ii) lightweight instruments and specially designed supports are needed to record weather data continuously and to enable observers with portable instruments to investigate fire-weather patterns in greater detail.

601. SCHAEFER, V. J. **Use of the 60-second print camera for stereophotography of project fires and related activities.** *Fire Control Notes* 20 (3), 1959 (89–90).

Discusses the uses and advantages of the polaroid system of rapid-process photographic reproduction in forest operations where immediate evaluation of the visual record is very important e.g. a forest fire, lumbering operations, insect epidemics, roadbuilding progress, etc. [Cf. *F.A.* 20 No. 4728.]

432. Prevention and Control

See also No. 371.

602. **Manual for forest fire control. Fire fighting methods and techniques.** Northeastern Forest Fire Protection Commission, Chatham, N.Y. 1958. pp. [3] + iv + 268 + 8 appendices. Price $2.50. [Cf. *F.A.* 16 No. 4193.]

603. RIEBOLD, R. J. **Tractor-plow tactics.** *Fire Control Notes* 20 (3), 1959 (69–76). 4 refs.

Studies the basic theoretical relationships between the movement of ordinary (as opposed to high-intensity) forest fires and that of the plough, and considers the resultant practical applications in tractor-plough methods of fire suppression.

604. Waldbrand. **[Forest fires.]** *Suppl.* to *Forst u. Jagd.* 9 (7), 1959. pp. 15. 6 refs. [G.]

Includes articles on the development and planning of living fire-breaks in Pine forests in the Dessau region (*Hübener*) and the Oberlausitz (*K. P. Klingauf* and *G. Liess*) and on the use of explosives [to clear fire lines] in forest fire control (*H. Wersenger*).

605. LIEBENEINER, E. Die Aufgaben des Forstmannes bei einem Waldbrand. **[A forester's tasks in a forest fire.]** *Forst- u. Holzw.* 14 (15), 1959 (315–6, 318). [G.g.]

An essentially practical account, based mainly on experience with a large fire in June, 1959, in Die Göhrde, W. Germany, which destroyed 420 ha. of Pine of all ages, mainly thickets. Points mentioned are, *inter alia*, the use of armoure dvehicles to crush down thickets to form a fire-line, and the danger of counter-firing, which in the author's opinion is rarely advisable.

606. **Helicopter accessories for forest fire control (a progress report).** *Technical Equipment Report, U.S. Forest Service, Washington* No. *F*-7, 1959. pp. 39.

Gives specifications and photographs of a

number of accessories, including signal warning lights, safety steps and handrails, cargo racks, and safety harness.

607. STOREY, T. G., WENDEL, G. W., and ALTOBELLIS, A. T. **Testing the TBM aerial tanker in the southeast.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 101, [1959?]. pp. 25. 36 refs.

Presents operational data and results of TBM kaolin calibration tests in Georgia and N. Carolina in 8 different fuel types (4 in each State) and the results of borate and wet-water drops on test fires. Over-all pattern size for 220-, double 220-, or 400-gal. kaolin drops made from altitudes between 50 and 100 ft. was ca. 370 × 75 ft. in all fuel types. Patterns were fairly uniform. The amount of slurry that reached the ground varied with the size of load, height of drop, cover type and wind velocity. In the fire-drop tests, indirect attack with 440 gal. of borate slurry retarded an average of 275 ft., and extinguished 255 ft., of medium-intensity headfire in medium-dense Pond Pine timber with dense brush and reed understorey. Estimated minimum application rates on the ground of ca. 0·4 and 0·5 gal./100 sq. ft. were required. Borate drops similar to these, in very open Pond Pine timber with dense brush and cane understorey, retarded 300 ft. and extinguished 275 ft. of headfire. Estimated minimum application rates were 0·5 and 0·6 gal./100 sq. ft. to retard and extinguish respectively. Heavier applications were needed in the Palmetto/Gallberry fuel types of the coastal plains. Direct attack with 440 gal. wet water achieved about the same results as indirect attack with borate in similar fuel types and under similar burning conditions. Minimum application rates were about the same for both agents. *From authors' summary.*

608. INOUE, K., and MASUDA, H. **[The use of chemicals in brush and grass fire control.]** *Extr.* from *Ann. Rep. For. Exp. Sta., Hokkaido 1957*, 1959 (40–8). 5 refs. [Jap.e.e.]

Discusses the results of laboratory and field experiments in control by the use of chemicals applied by direct spray, fog, or dry-powder or acid-alkali extinguisher, and of field pretreatment experiments.

435. Benefits of Fire Control. Injurious Effects of Fire

609. **Mortality indicators for Longleaf and Slash Pine.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1958*, 1959 (16).

In a study of 480 trees after a headfire in March 1946, equal proportions of large and small trees of both species were found to have died from equal amounts of crown damage. Nearly 9 trees in 10 died when > 50% of their needles were consumed by flame, and 4 in 10 succumbed when < 50% of their crowns were consumed. Even 100% needle browning, however, caused no mortality, presumably because initial temperatures of buds and cambium were low (ca. 45° F.). Height of bark char in the stem was also related to mortality Ca. 9 trees in 10 died when ⩾ 80% of the stem was charred, and 4 in 10 when 60–80% of the stem was blackened; mortality was negligible when < 60% of the stem was affected.

436. Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry

See also Nos. 26, 600.

610. COUNTRYMAN, C. M., and SCHROEDER, M. J. **Prescribed Burn Fireclimate Survey 1–57.** *Tech. Pap. Calif. For. Range Exp. Sta.* No. 29, 1958. pp. 14. 1 ref.

A burn on the San Joaquin experimental range in 1957 behaved as could be expected from the wind pattern, fuel distribution and method used. The apparent anomaly of the increasing wind speed ahead of the fire needs further investigation and emphasizes the need for laboratory studies.

611. BISWELL, H. H. **Prescribed burning in Georgia and California compared.** *Repr.* from *Journal of Range Management, Portland* 11 (6), 1958 (293–7). 15 refs.

Compares conditions and methods used in prescribed burning of Southern Pine forests with those in second-growth Ponderosa Pine in California. The study is based on several years' experience in each region.

44. Damage by Harmful Plants. Virus Diseases

441. Weeds

See also Nos. 294, 371, 418, 463–4, 488–9.

612. ***Gleichenia polypodioides* control.** *Extr.* from *Rep. Dep. For. S. Afr. 1956/57*, 1959 (13).

It had been found incidentally that Gleichenia vigour apparently varies inversely with the amount of basic fertilizer applied, and a further study was made. Light intensity was measured under *Pinus canariensis* on plots given different fertilizer treatments; differences were found to be significant and correlated with the % area of fern per plot. It would thus appear that the marked control of Gleichenia observed in some of the plots is due to a reduction in light intensity on the ground as a result of the greater vigour imparted to the Pine on plots receiving the most fertilizer. This does not preclude the possibility that Gleichenia is also sensitive to soil pH since, where it had been sprinkled experimentally with lime at a rate of 4 oz./sq. yard, it still showed an obvious lack of vigour a year later. This application, however, was insufficient to change the pH appreciably, and the effect of larger applications will now be studied.

613. KLJUČNIKOV, L. JU. Čuvstvitel'nost' molodyh drevesnyh porod k gerbicidu 2M-4H. **[The sensitivity of young tree species to the herbicide MCPA.]** *Dokl. Vsesojuz. Akad. Sel'.-Hoz. Nauk Lenina* No. 5, 1959 (41–4). 6 refs. [Russ.] A.P.B.

Trials were made in 1956 and 1957 with various concentrations of MCPA sprayed on trees in belts established in 1950–53, and also on natural regeneration under the canopy of mature stands. Results indicated that: trees growing in the open (i.e. faster) were more sensitive than those under canopy; spraying in May–June was more harmful than in

Sept.; in some species younger (1-year) trees were more resistant than older (3- to 8-year) ones. In experiments on differences in sensitivity between species, faster growing species such as *Betula verrucosa* and *Fraxinus pennsylvanica* proved most sensitive, species with moderate growth such as *Acer tataricum* and *A. platanoides* less so, and slow growing species such as *Quercus robur* and *Tilia cordata* least sensitive.

614. Shiue, C.-J., Hossfeld, R. L., and Rees, L. W. **Absorption and translocation of 2,4,5-trichlorophenoxyacetic acid derivatives in Quaking Aspen.** *For. Sci.* 4 (4), 1958 (319–24). 8 refs.

2,4,5-T (2·5 g./100 c.c. diesel oil) was applied in different forms and by different methods to young potted plants of *Populus tremuloides*. The physiological response of the plants to the chemical is described. While butoxyethyl ester and pure ester forms of 2,4,5-T applied externally to the bark killed the plant, the pure esters applied to the exposed wood of a freshly girdled stem did not. Applications of 2,4,5-T ester emulsified with an Aspen extractive to a freshly girdled surface, however, proved fatal; components of the extractive, probably saponins, appeared to contribute largely to the effective absorption and translocation of the chemical. The presence of these materials in Aspen bark may explain the sensitivity of the plant to bark applications of the pure ester form of 2,4,5-T.

615. Walker, L.C., Beck, E., and Dumbroff, E. **Absorption rates of 2,4,5-T tagged with carbon-14.** *For. Sci.* 5 (2), 1959 (128–37). 20 refs.

Seedlings of Water Oak (*Quercus nigra*) and Sweetgum were treated with (1) acetone, (2) triethylamine-salt and (3) NH_4 salt solutions of labelled 2,4,5-T, applied as droplets to upper leaf surfaces. With Oak, absorption of (2) was best, followed by (1) and (3); with Sweetgum the order was (1), (2), (3). Absorption did not increase after 1 day for Oak nor did the rate differ between upper and lower leaves. For Sweetgum, however, concentrations increased with time elapsing between treatment and sampling; leaf position was ignored in the Sweetgum experiments. Chromatographic tests showed that very little C^{14} from the 2,4,5-T was transferred to other compounds. [Cf. *F.A.* 19 No. 562.]

616. Ivens, G. W. **The effects of arboricides on East African trees and shrubs. III. *Combretum* and *Commiphora* species.**] *Trop. Agriculture, Trin.* 36 (3), 1959 (219–29). 9 refs.

[Cf. *F.A.* 20 No. 3317.] A series of experiments is described in which 2,4,5-T and 2,4-D were tested as arboricides on various species of *Combretum* and *Commiphora* common in East Africa. NH_4 sulphamate and monuron were also tested on a smaller scale. NH_4 sulphamate was ineffective in aqueous solution as a basal spray or applied in the form of crystals to stumps. Monuron, although its effects developed slowly, showed more promise when applied at a relatively high rate. Species of *Combretum* varied considerably in their susceptibility to the growth regulator but, in general, were less affected than species of *Commiphora*, the aerial parts taking longer to exhibit signs of injury and regeneration occurring more readily. Concentrations of 2,4,5-T of ca. 1·5–2·0% were generally more effective on *Combretum* species than lower concentrations. With *Commiphora* species, however, concentration appeared relatively unimportant on frilled trees; 0·25% was as effective on *C. schimperi* as 1·0%. On unfrilled trees higher concentrations were needed to give an equivalent kill. Less extensive tests with 2,4-D indicated that it is not much less effective. Emulsions of 2,4,5-T ester in water or solutions of an amine salt proved considerably less effective as basal stem sprays than solutions of ester in diesel oil but, in one trial, the emulsions were only slightly less effective on stumps of *Commiphora schimperi*. Frilling generally increased the effectiveness of treatment. Treatments applied to stumps prevented regeneration to about the same extent as basal stem sprays. Little difference between treatments applied at different times of year was noted with *Combretum* species, but with *Commiphora schimperi* a slightly greater development of regeneration occurred after treatment in the dry season than during the rains. *From author's summary.*

617. **Weedicides.** *Extr.* from *Rep. Dep. For. S. Afr. 1956/57*, 1959 (12).

In a large-scale, stump-killing experiment in the *Eucalyptus saligna* thinning plots at Langepan, a 3–5% solution of 2,4-D or 2,4,5-T in power paraffin was found to be most effective. Application must be made immediately after felling and directly to the cambium layer after prising up a frill of bark round the stump (the stumps had a mean diam. of 7 in. and were felled 3 in. above the ground). Power paraffin is cheaper than diesel oil and equally effective.

442. Parasitic (Higher) Plants. Epiphytes. Climbers

618. Laubenfels, D. J. de. **Parasitic conifer found in New Caledonia.** *Science* 130 (3367), 1959 (97). O.R.S.

A specimen of *Podocarpus ustus* growing parasitically on the base of a tree of *Dacrydium taxoides* is described. The attachment was by modified roots imbedded between the cork cambium and the vascular cambium. The probability that most individuals of *P. ustus* are root parasites is discussed.

619. Tso-Chie, H. **The Loranthaceae of Kwangsi.** *Acta Phytopathologica Sinica, Peking* 1 (2), 1955 (217–30 + 1 plate). 5 refs. [Chin.e.] I.M.I.

Many Loranthaceae are encountered on various economic trees in Kwangsi Province, viz. 5 species of *Loranthus*, 3 species and one variety of *Elytranthe*, and 2 species of *Viscum*. Host species number 67. Damage inflicted is described. Use of resistant species and/or mechanical control are recommended. *From author's summary.*

620. Hawksworth, F. G. **Ballistics of dwarf Mistletoe seeds.** *Science* 130 (3374), 1959 (504). O.R.S.

Results of experiments with *Arceuthobium vaginatum* f. *cryptopodum* showed: mean vertical height reached by seeds expelled directly upward, 460 cm.; terminal velocity 750 cm./sec.; mean seed weight 2·4 mg.; and seed sp. gr. about 1. Initial velocity was calculated as ca. 1370 cm./sec. and initial acceleration as $4{\cdot}7 \times 10^6$ cm./sec.^{2} or nearly 5000 *g*.

621. SINGER, O. **Contribution to the knowledge of Mistletoe (*Viscum album*).** *Pharmazie, Berlin* 13, 1958 (781–3). [G.] From *abstr.* in *Chem. Abstr.* 53 (12), 1959 (11528). P.R.

In attempts to characterize 3 physiological races of *V. album*—(*a*) on Apple, (*b*) on *Abies alba*, and (*c*) on *Pinus sylvestris*—leaf size, colour and texture proved of minor value. There were no great differences in pH of the leaf-pressed winter juice, viz. (*a*) 5·50, (*b*) 5·80, and (*c*) 5·60; the summer juices were less acid. Total ash contents were respectively 7·96, 13·06 and 14·34%, the stem ash content showing no significant differences, while the ash content insoluble in 10% HCl ran roughly parallel (0·82, 0·68 and 0·62%).

443. Fungi and Bacteria

See also Nos. 125, 138, 1296.

622. SAWADA, K. **[Researches on fungi in the Tohoku district of Japan. (IV) Fungi imperfecti.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 105, 1958 (35–140). [Jap.]

List 293 fungus species, including 63 new species with Latin descriptions, and ca. 250 hosts, including many trees. [Cf. *F.A.* 14 No. 3473.]

623. TORRES JUAN, J. Las royas de los pinos españoles. **[Rusts of Spanish Pines.]** *Bol. Serv. Plagas For., Madrid* 2 (3), 1959 (37–40). [Span.]

Notes on *Cronartium ribicola*, *Melampsora pinitorqua* and *Coleosporium senecionis*, symptoms of their attack, and methods of control.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also No. 628.

624. VOLGER, C. Erfahrungen mit fungiziden Beizmitteln, Präparaten zur Keimlingsbehandlung und Bodendesinfektionsmitteln im Koniferen-Saatbeet. **[Experience with fungicidal seed dressings, preparations for seedling treatment, and soil disinfectants in conifer seedbeds.]** *Forstwiss. Cbl.* 78 (7/8), 1959 (231–43). 10 refs. [G.g.]

Reports further work with TMTD [cf. *F.A.* 20 Nos. 1991–2, 4772]. Four preparations, all containing TMTD as the active principle, gave satisfactory results when used to disinfect Norway Spruce seed, and did not harm the seedlings. In another investigation, a parasitic fungus (probably *Cladosporium* sp.) attacking Douglas Fir seedlings, was controlled by spraying the seedlings and soil with TMTD and captan preparations, and keeping the substrate moist. A preliminary trial of soil disinfection was made with a Vapam preparation (active principle Na-*n*-monomethyl dithiocarbamate), which works as a fungicide, herbicide, insecticide and nematicide. European Larch seedlings grown on soil disinfected with Vapam were noticeably larger and more vigorous than controls, and even after two growing season there was still less weed growth. A large-scale trial confirmed the efficacy of Vapam as a herbicide, but the trial was spoiled by a soil fungus, *Trichoderma* sp., which killed the test plants (Scots Pine).

625. **Nursery diseases [of Southern conifers].** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1958*, 1959 (46).

Of 40 fungicides tried against *Cupressus arizonica* blight in Georgia, phenyl mercury dithiocarbamate proved the most promising. Semesan and Kromrad partly controlled *Phomopsis* blight on *Juniperus silicola*. *Cylindrocladium scoparium* causing root rot and top disease in *Abies fraseri* and *Pinus strobus* was checked for one season by MeBr.

626. SATO, K., and SHOJI, T. **[Sclerotial root-rot of coniferous seedlings caused by *Sclerotium bataticola* Taub.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (51–72 + 4 plates). 38 refs. [Jap.e.*e*.]

Reports laboratory studies of the growth and development of the pathogen; experimental inoculation of *Pinus densiflora* and *Cryptomeria japonica* which produced root rot in inoculated seedlings; determination of temperature, soil moisture and soil pH favourable to its development; and tests of toxicity of various fungicides to the fungus.

443.3. Diseases of Older Stages

627. SCHAD, C., GRENTE, J., and SOLIGNAT, G. La protection de la châtaigneraie contre les maladies en France. **[The protection of Chestnut groves in France against diseases.]** [*Docum.*] *4th Sess. Comm. Int. Chât. 1958* No. *FAO/CH*25-*Ab*, 1958. pp. 21. 17 refs. [F.]

Discusses the diseases caused by (*a*) *Phytophthora cambivora* and *P. cinnamomi*, (*b*) *Endothia parasitica* and (*c*) *Diplodina castaneae*, and their control chiefly by breeding for resistance against (*a*) and (*b*).

628. RIDE, M., and GUDIN, G. Aspects de la biologie du *Phoma endogena* (Speg.) et de quelques autres champignons parasites de la châtaigne. **[The biology of *P. endogena* and other parasitic fungi of chestnuts.]** [*Docum.*] *4th Sess. Comm. Int. Chât. 1958* No. *FAO/CH*/24-*Ac*, 1958. pp. 10. [F.]

P. endogena, causing decay in the nuts, was shown to be a secondary parasite attacking weakened organs or those approaching dormancy, entering through wounds and giving rise to temporary and local necroses. In preliminary laboratory tests of fungicides against *P. endogena*, *Endothia parasitica*, *Diplodina castaneae* and *Cytospora* spp., phenylmercuric nitrate was the most effective. The role of insects, particularly *Pammene juliana*, in spreading infection is briefly discussed.

Stem, Butt and Root Rots; Root Diseases

See also Nos. 717, 793, 1112, 1151.

629. LANGE, S. Das Erkennen von Stammfäulen mit Hilfe zerstörungsfreier Prüfverfahren.

[Diagnosis of stem rots with the aid of non-destructive methods of testing.] *Forstwiss. Cbl.* 78 (5/6), 1959 (174–80). 21 refs. [G.g.]

Briefly reviews ocular, X-ray, sonic and ultrasonic, and radioactive-isotope methods of diagnosing rot in standing trees. The accuracy of the various methods is discussed.

630. ROTH, E. R. **Heart rots of Appalachian hardwoods.** *For. Pest Leafl. U.S. For. Serv.* No. 38, 1959. pp. 4. 6 refs.

Briefly describes heart rots caused by *Stereum frustulosum, Hydnum erinaceus, Polyporus sulphureus, P. berkeleyi, S. gausapatum, Poria spiculosa* and *Polyporus hispidus.*

631. TWAROWSKI, Z., and TWAROWSKA, I. Studia i obserwacje nad opieńką miodową *Armillaria mellea* (Vahl.) Quél. jako przyczyną masowego zamierania drzewostanów. **[Studies and observations of *A. mellea* as a cause of mass decline of stands.]** *Prace Inst. Bad. Leśn.* No. 192, 1959. pp. 63 + 3 maps. 136 refs. [Pol.russ.e.]

Reviews N. American and European literature, using this, and data from personal observations, to determine predisposing conditions for mass attack, particularly on Spruce. The fungus almost exclusively attacks trees already weakened by some other (usually environmental) factor. The influence of soil, climatic and silvicultural factors on the spread of the attack, are discussed. Control is also discussed: measures may be direct or indirect, and more use of the latter is urged, by e.g. careful site selection, using suitable seed, good forest sanitation, etc.

632. RISHBETH, J. **Dispersal of *Fomes annosus* Fr. and *Peniophora gigantea* (Fr.) Massee.** *Trans. Brit. Mycol. Soc.* 42 (2), 1959 (243–60). 6 refs. O.B.D.

Measurements of spore deposition in forests, obtained by exposing freshly cut sections of Pine stem, indicate that in relatively calm conditions rates exceed 20 spores/100 sq. cm./hr. close to sporophores. Deposition rates of 1–5 spores/hr. are commonly encountered in well ventilated plantations where local spore sources occur. A simple method is described of trapping spores on muslin squares [cf. *F.A.* 20 No. 709]: they are later recovered by shaking with sterile water and plating the suspension on Pine sections. By this means *Fomes annosus* and *Peniophora gigantea* were found to be regular components of the air spora in Britain. At selected places the rate of deposition on muslin squares was determined in winds of varied direction, and for both species rates of over 20 spores/100 sq. cm./hr. were recorded close to forests. Rates declined with distance from source, but in the Shetland Islands, some 200 miles from source, the two fungi and other forest species were still detectable. Another method is given for determining the number of *F. annosus* spores on samples of conifer foliage. Examination of samples from some British forests shows that spores are widespread and vary greatly in abundance; there is some relation with proximity to sporophores. The limitations of this method for assessing the risk of stump infection in plantations are discussed. *Author's summary.*

633. ZYCHA, H., and BRAND, W. Eine Methode zur Bestimmung des Grades der Zerstörung von Fichtenholz durch *Fomes annosus* mit Hilfe des Mikroskopes. **[A method of determining microscopically the stage of decay of Spruce wood by *F. annosus*.]** *Phytopath. Z.* 35 (4), 1959 (411–9). 11 refs. [G.g.e.] O.R.S.

The method involves the counting of the holes bored in tracheid walls by the hyphae (illustrated in photomicrographs). The samples (e.g. increment cores) are macerated for examination, but not stained. The number of holes per mm. of tracheid are related to the degree of rot (light or dark hard rot, soft rot) and the reduction of density.

634. BAZZIGHER, G. Der Wuchsstoffbedarf zweier phytopathogener Pilze. **[The growth-substance requirements of two phytopathogenic fungi.]** *Phytopath. Z.* 32 (4), 1958 (352–8). 3 refs. [G.g.e.] O.R.S.

Discusses the supplementary growth substances (an N compound plus vitamins or co-enzymes) needed in addition to the nutrient substances in a Knop-glucose solution by cultures of *Endothia parasitica* and *Trametes radiciperda* [*Fomes annosus*].

635. KRSTIĆ, M. O obimu truleži bukovih debala u Južnom Kučaju. **[The extent of decay of Beech stems in Južni Kučaj.]** *Šumarstvo* 12 (1/2), 1959 (13–27). 6 refs. [Serb.serb.e.]

Eighteen Beech stems attacked by *Fomes fomentarius* at Južni Kučaj were felled and analysed. The extent of decay was indicated less by the number of fruiting bodies than by their distribution on the stem. An attack up to 4 m. above ground rendered all the stem below this height unsuitable for the more valuable assortments; above this height the extent of decay was related to the resistance of the stem to frost and heat. Neither the number nor distribution on the stem of fruiting bodies showed the volume of completely useless wood, which depended on the development of heartwood rot. At the level of the fruiting bodies, ca. 50% of the wood was attacked and was generally completely useless. The presence of other wood-destroying fungi in the zone of attack did not necessarily indicate advanced decay. One stem each with fruiting bodies of *Trametes gibbosa* and *Schizophyllum commune* were also examined and the extent of decay is reported.

636. MOCANU, V. Contribuţii la studiul biologiei ciupercii *Trametes gallica* Fr. f. *trogii* Berk. **[Studies of the biology of *T. gallica* f. *trogii*.]** *An. Inst. Cerc. Silv., Bucureşti* (*Ser. I*) 18, 1957 (95–108). 7 refs. [Rum.russ.f.]

Detailed report on laboratory cultures and successful inoculation of healthy Poplars with them. [Cf. *F.A.* 20 No. 2010.]

637. SUTHERLAND, C. F., NEWHOOK, F. J., and LEVY, J. **The association of *Phytophthora* spp. with mortality of *Pinus radiata* and other conifers. II. Influence of soil drainage on disease.** *Repr.* from *N.Z. J. agric. Res.* 2 (4), 1959 (844–58). 4 refs. [Cf. *F.A.* 20 No. 3336.] Data from 1570 *P.*

radiata and 863 *Cupressus macrocarpa* stands, following deaths and defoliation in the very wet 1956 season (on better, as well as poorly drained soils), indicated that (1) soil drainage, though a strong influence on the severity of symptoms, had no major influence on the extent of disease, except on very poorly drained soils; (2) although initially far more susceptible to the disease, *P. radiata* showed a far higher recovery rate than *C. macrocarpa* on all soil types; (3) *P. radiata* susceptibility increased and the recovery rate of affected trees decreased, with increasingly poor soil drainage, but *C. macrocarpa* susceptibility was greatest at both extremes of soil drainage, and its recovery rate in infected stands was uniformly fairly low. An attempt is made to explain the differences in behaviour of the two species on the basis of different rates of rootlet regeneration and fascicle or branchlet abcission. The data could not be explained by soil physical factors alone without the presence of a pathogen, and the facts emphasize that the 1956 epidemic was caused by *Phytophthora* attack during a prolonged wet season, the amount and severity of the disease being influenced by soil drainage. *From authors' summary.*

638. BAKSHI, B. K., and SINGH, S. **Root diseases of Shisham (*Dalbergia sissoo* Roxb.). VIII. Inoculation studies on wilt.** *Indian For.* 85 (7), 1959 (415–21 + 3 plates). 5 refs.

Artificial inoculation of trees with *Fusarium solani* f. *dalbergiae* produced all the symptoms of wilt observed in nature in diseased trees. [Cf. *F.A.* 20 No. 4789.]

Wilts, Diebacks etc.

See also No. 696.

639. AZEVEDO, N. F. DOS SANTOS DE, and SANTOS, A. C. DOS. *Botryosphaeria berengeriana* de Not. em *Eucalyptus globulus* Labill. **[*B. berengeriana* on *E. globulus*.]** *Agron. lusit.* 17 (2/4), 1955 (191–204 + 1 plate). 40 refs. [Port.f.]

A disease characterized by vascular wilt symptoms was observed in *E. globulus* in 1954. A necrotic ring 5–10 cm. in height was observed on the stems of affected trees. The pathogen is thought to be a fungus having a perithecial form (*Botryosphaeria berengeriana*) and two imperfect forms—micropycnidial (*Dothiorella berengeriana*) and macropycnidial (*D. vulgaris*). Fruit bodies of *Dothiorella* spp., but none of *B. berengeriana*, were obtained in culture. Inoculation experiments gave inconclusive results.

640. OHMAN, J. H., ANDERSON, N. A., and FRENCH, D. W. **Comparison of dry and chemical girdling to prevent sporulation of the Oak wilt fungus.** *J. For.* 57 (7), 1959 (503–6). 11 refs.

Red Oaks of 3–15 in. d.b.h. were inoculated with a conidial suspension of *Ceratocystis fagacearum* and, when incipient wilt involving $< 10\%$ of the crowns was observed, the trees were (1) dry-girdled by removing all the sapwood in a 1-in. ring immediately above ground level, or (2) chemically girdled by removing a 6-in. strip of bark and painting Na arsenite on the exposed sapwood. The trees were examined weekly for mycelial mats. Method (2) was the better: mat production in spring was eliminated, the average number of mats/tree was much less, the duration of new mat production much shorter, and mat size smaller than on ungirdled inoculated trees (3). The average number of mats per tree was less, and the duration of new mat production was shorter on (1) than on (3).

641. BOYCE, J. S., JR. **Oak wilt spread in control-treated and untreated counties in the Southern Appalachians.** *J. For.* 57 (9), 1959 (660–1). 2 refs.

Compares the numbers of new Oak-wilt centres per 100 sq. miles in 1954 and 1958 in counties where (*a*) no control is practised, and (*b*) wilting trees are felled and sprayed with a BHC/PCP mixture in fuel oil, and the stumps treated with Ammate to prevent sprouting. The control measures appear to check the spread of the wilt considerably.

Cankers, Stem Rusts etc.

See also Nos. 293, 441, 623, 628, 1117.

642. KOBAYASHI, T. ***Phomopsis* disease of Japanese Cedar *Cryptomeria japonica* D. Don with special reference to the life history and taxonomy of the causal fungus.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 107, 1958 (1–25 + 12 photos). 35 refs. [Jap.E.jap.e.]

Describes inoculation experiments with *Phomopsis* and *Diaporthe* spp. on several conifers and hardwoods, from which it is concluded that the *Phomopsis* of *C. japonica* is the conidial stage of the *Diaporthe* found on it, identified as *D. conorum*, and that it is identical with *P. occulta* infecting *Abies mayriana* and also with the fungus, previously called *P. pseudotsugae*, found on *Larix leptolepis*. The fungus was a true wound parasite. It was not very virulent on *C. japonica* or *Chamaecyparis obtusa*, and did not infect hardwoods. Taxonomy, physiology, temperature relations etc. are discussed.

643. ITO, K., and ZINNO, Y. **[*Dasyscypha* on *Larix leptolepis* in Japan.]** *J. Jap. For. Soc.* 39 (11), 1957 (452–5). 10 refs. [Jap.]

A *Dasyscypha* found in a 45-year-old plantation in Honshu was found on microscopic examination to resemble *D. willkommii*, rather than the Japanese species *D. abieticola* usually found on *Abies firma.*

644. GEORGESCU, C. C., and CLONARU, A. **Apariţia cancerului bacterian al plopului în R.P.R. [The occurrence of bacterial canker in hybrid Black Poplars in Rumania.]** *Rev. Pădurilor* 74 (3), 1959 (169–71). 8 refs. [Rum.russ.g.f.e.]

645. DAY, M. W., and STRONG, F. C. **A study of *Hypoxylon* [*pruinatum*] canker on Aspen [*Populus tremuloides*].** *Quart. Bull. Mich. Agric. Exp. Sta.* 41 (4), 1959 (870–7).

On plots in 11- to 29-year stands examined annually from 1948 to 1956 inclusive, canker incidence was greater in the less dense stands. Growth rates varied considerably between cankers, and for the same canker with the season, being greatest in a cool dry season. The level of the canker on the bole was directly related to tree d.b.h., being higher on larger trees. Infected trees generally died

3 years after the canker became visible; where it occurred in the upper part of the crown the tree sometimes recovered. Attempts to induce cankers artificially on young trees failed.

646. **[Insect attack on Aspen and *Hypoxylon* [*pruinatum?*].]** *Rep. Lake St. For. Exp. Sta. 1958*, 1959 (38–9).

[Cf. *F.A.* 16 No. 1924.] Some tentative conclusions from observation on Poplar borers in a 30-year *Populus tremuloides* stand in N.E. Minnesota are: (1) no simple, direct relation existed between incidence of borer attack and *Hypoxylon* canker; (2) in stands averaging ⩾ 5 in. d.b.h., successful borer attacks were found on trees of or slightly above this d.b.h., and (3) no relationship was found between incidence of borer attack and stand density or b.a., though there were slightly fewer trees within a 5-ft. radius of attacked than of unattacked trees (1·85 vs. 2·11). None of the stand factors so far studied appeared to affect incidence of attack. In laboratory studies of the role of insects in the spread and development of *Hypoxylon*, no typical cultures were obtained from 400 surface-sterilized pieces of inner bark taken from areas of oviposition or feeding injury.

647. BUTIN, H. Über die auf *Salix* und *Populus* vorkommenden Arten der Gattung *Cryptodiaporthe* Petr. **[*Cryptodiaporthe* spp. found on *Salix* and *Populus*.]** *Phytopath. Z.* 32 (4), 1958 (399–415). 23 refs. [G.g.e.] O.R.S.

Describes the following species: *C. apiculata* (saprophytic on *Salix* and *Populus* spp.); *C. populea* (mainly parasitic, *Populus* spp.); *C. pulchella* (saprophytic, *Populus* spp.); and *C. salicella* (sometimes parasitic, *Salix* spp.), and discusses their nomenclature.

648. BIER, J. E. **The relation of bark moisture to the development of canker diseases caused by native facultative parasites. I. *Cryptodiaporthe* canker on Willow.** *Repr.* from *Canad. J. Bot.* 37 (2), 1959 (229–38 + 3 plates). 10 refs.

[Cf. *F.A.* 19 No. 1963.] A close correlation was found between the development of the bark canker in young stems of *Salix hookeriana* and *S. scouleriana* caused by *C. salicina*, and the moisture content of the bark. When m.c. was expressed as a % of the water required to saturate the sample under experimental conditions, relative turgidities of ⩾ 80% inhibited canker development, which, however, occurred normally at lower %s. In the Vancouver area the mean monthly temperature in the dormant season of 1957–58 was significantly higher than the minimum required by *C. salicina*, and turgidity was < 80%, and so cankers continued to develop. No canker extension occurred during the growing season in spite of favourable temperatures, apparently because relative turgidity was > 80%. *From author's summary.*

649. MILLER, D. R., KIMMEY, J. W., and FOWLER, M. E. **White Pine blister rust.** *For. Pest Leafl. U.S. For. Serv.* No. 36, 1959. pp. 8. 12 refs.

Briefly describes distribution, hosts, and life cycle of *Cronartium ribicola*, symptoms on Pines and on *Ribes* spp., and control measures.

Foliage Diseases

See also No. 623.

650. TACONIS, P. J., and BESEMER, A. F. H. Bestrijding van het dennenschot. **[Control of *Lophodermium pinastri*.]** *Ned. Bosb. Tijdschr.* 31 (7/8), 1959 (238–41). [Du.]

Makes recommendations based on Dutch and German experience [cf. *F.A.* 20 No. 4806] on the use of zineb sprays to control the fungus.

651. MENZEL, K. Vier Jahre Kiefernschüttebekämpfung im staatlichen Forstamt Kleve/Ndrh. **[Four years of control operations against *Lophodermium pinastri* in the Kleve district (Nordrhein).]** *Allg. Forstzeitschr.* 14 (26), 1959 (467–8). 5 refs. [G.g.]

Describes equipment, dosages, quantities, costs, etc. of operations in some 1600 ha. of young Pine plantations, using first knapsack sprayers (cost DM.61–96/ha.), then motor sprayers, helicopters and, finally, Piper aircraft (DM.44/ha.). In 1957 the area sprayed once remained 71% green, that sprayed twice 91%. Dithane proved more effective than Cu preparations.

652. SCHUMACHER, G. **Report on the control of leaf cast in Common Pine carried out in 1958 by the Bad Godesberg Plant Protection Service of the Rheinland Agricultural Chamber, Germany.** *Agricultural Aviation, The Hague* 1 (1), 1959 (9–12). [E.] O.R.E.

Tabulates in detail the data on the actual application (flights per day, flying hours, fuel, areas covered etc.) in applying Dithane [nabam-type] at 3 and 5 kg./ha. in 50 litres [water] by two helicopters, to control *Lophodermium pinastri* in large areas of *Pinus sylvestris*.

653. SCHICKE, P. Beobachtungen über den Einfluss der Kiefernschüttebekämpfung auf Wachstum und Bestand und Beitrag zur Ermittlung des optimalen Bekämpfungstermins. **[The effect of the control of *Lophodermium pinastri* on stand growth and density, and notes on the best time for spraying.]** *Allg. Forstzeitschr.* 14 (28), 1959 (513, 516). 12 refs. [G.g.]

A brief report on trials with one or two sprayings of 0·2% Dithane-Cela [zineb-type] on (*a*) 4-year-old, and (*b*) 2-year-old Pines in Gross-Gerau [Hesse]. Two sprayings were more effective than one, and late July/late August better than late June/late July, but even after the August spraying further infection occurred. Timing according to Rack [cf. *F.A.* 17 No. 2979] is thought to have led to slightly premature spraying. In (*b*), height growth was increased and mortality reduced considerably compared with controls.

654. GREMMEN, J. Über zwei Phacidiaceae von *Pinus silvestris* L. **[Two Phacidiaceae of *P. sylvestris*.]** *Phytopath. Z.* 35 (1), 1959 (27–30). 4 refs. [G.g.e.] O.R.S.

Apothecia of *Phacidiella coniferarum*, the perfect

form of *Phomopsis pseudotsugae*, were found for the first time in Europe on branches of Scots Pine killed by heavy snow in 1957–58. Apothecia of *Phacidium lacerum* were found in early spring on fallen needles. The two fungi were cultured and are described.

655. ROTH, L. F. **Perennial infection of Ponderosa Pine by *Elytroderma deformans*.** *For. Sci.* 5 (2), 1959 (182–91).

Pines 30–50 years old from suppressed understorey stands 3–5 ft. high, were divided into 4 groups: (*a*) healthy, (*b*) diseased, with blighted branches pruned off, (*c*) diseased, with all blighted needles removed, (*d*) diseased. These were then transplanted to (1) sites within the infection centre, (2) sites close to but outside it, and (3) climatically different, disease-free sites. Irrespective of treatment, needles on once blighted branches showed symptoms of disease in the following year. Branchlets of some of (*b*) showed symptoms in the following year, but (*a*) trees remained healthy. In the first season there was no difference between trees in (1), (2) and (3). Later on, trees in (3) recovered. From this it is concluded that branchlets are systemically infected, that the infection can be perennial, and that it may extend back into woody branches several years old. This suggests that traditional control methods, such as spraying, may be ineffective [cf. *F.A.* 16 Nos. 1930, 3149].

656. WAGENER, W. W. **The effect of a western needle fungus (*Hypodermella medusa* Dearn.) on Pines and its significance in forest management.** *J. For.* 57 (8), 1959 (561–4). 7 refs.

The disease is widespread in the interior Pine stands of the West, but only in localized areas where usually < 10% of the trees are affected. Susceptibility is apparently inherited and is relatively constant. Only older and physiologically less active foliage is attacked, and the poorer the site, the more severe and frequent the disease. Drought, especially in autumn, favours increased incidence of the disease. Years of high incidence tend to be followed by years of low, because heavy infections remove most of the susceptible foliage. On marginal sites, diameter growth and condition of susceptible trees are impaired, which results in earlier death. Present evidence does not indicate that *H. medusa* is a major loss factor in Pine stands of the Western U.S.A.

657. BOYCE, J. S., JR. **Brown spot needle blight on eastern White Pine.** *Plant Dis. Reptr.* 43 (3), 1959 (420). 3 refs. A.P.B.

Scirrhia acicola was collected from *Pinus strobus* trees suffering from this blight in western N. Carolina. A possible connexion with the so-called White Pine blight disease is suggested.

658. ITO, T. [***Pellicularia koleroga* Cooke causing thread blight of *Ginkgo biloba*.**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 105, 1958 (11–8 + 10 photos). 7 refs. [Jap.jap.e.*e.*]

Describes the symptoms of the disease, observed for the first time in Japan in 1952 on a tree near Tokyo, and the morphology and physiology of the pathogen, identified as *P. koleroga*. It appeared capable of growth between 18 and 30° C., with an optimum at 25° and a pH of ca. 6·7. Attacked twigs became stunted, but did not die though the tree was weakened.

659. TAKAI, S. [**Nutritional studies on *Cercospora cryptomeriae* Shirai causing the needle blight of *Cryptomeria japonica*.**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (43–50). 27 refs. [Jap.e.*e.*]

A study of the growth of the fungus when supplied with different sources of C and N.

660. **Anthracnose or leaf scorch of shade trees.** *Pamphlet, Cooperative Extension Service, Iowa State College, Ames* No. 256, 1959. pp. 4.

661. SCHWENKE, H. J. Untersuchungen über Sporenkeimung und Myzelwachstum von *Septotis populiperda* Waterman et Cash. [**Studies on [the influence of humidity and temperature on] spore germination and mycelial growth [in culture] of *S. populiperda*.**] *Phytopath. Z.* 35 (4), 1959 (389–400). 15 refs. [G.g.e.] O.R.S.

662. DANCE, B. W. **The taxonomy of fungi causing leaf and twig blights of North American Poplars.** *Proc. 6th Mtg. Comm. For. Tree Breeding Can., Montreal 1958, Part 2*, 1958 (*R*15–*R*17).

Concludes that there are two fungi involved—*Venturia populina* (imperfect stage *Pollaccia elegans*) and *V. tremulae* (imperfect stage *Fusicladium tremulae*).

Other Diseases caused by Fungi or Bacteria

663. CH'ÊN, S.-C. [**A preliminary study on flap rust of Spruce (*Thekopsora areolata*) (Fr.) Magn.**] *Acta phytopath. sinica* 5 (1), 1959 (35–44). 18 refs. [Chin.e.] I.M.I.

Flap rust is a serious disease of *Picea asperata* and *P. purpurea* in the Sun Chuen basin of Szechuan province. Ca. 64·5% of *P. asperata* and 30·7% of *P. purpurea* are infected. Environmental conditions profoundly affect susceptibility to attack. Most susceptible are plantations on sand banks, trees at 3210–3400 m. alt., solitary trees, and those along forest margins. Greater resistance to attack in *P. purpurea* is attributed to the abundance of resin on the cones. The disease weakens seedlings, delays growth, and lowers the quality of the seed. A tentative schedule of control has been proposed. *From author's summary.*

664. ZWOLIŃSKA, Z. Niezane zjawisko zachodzące w patologicznych utworach owocostanów olszy szarej (*Alnus incana* [L.] Mnch.). [**A hitherto unknown disease: pathological outgrowths on the fruiting catkins of *A. incana*.**] *Roczn. Dendrol. Polsk. Tow. Bot., Warsz.* 13, 1959 (111–8). 9 refs. [Pol.]

The disease is caused by *Taphrina alni-incanae*. Longitudinal sections of the outgrowths are presented, and their structure illustrated and discussed.

451. Mammals

See also Nos. 56–8, 482, 490, 504.

665. DEBREYNE, J. P. A. Un élément indispensable et méconnu des régénérations en essences forestières de valeur: la faune des carnassiers et des rapaces. L'exemple des forêts domaniales du Valois. **[An indispensable and misunderstood factor in the regeneration of valuable forest species: the carnivores and birds of prey. The example of the state forests of Le Valois.]** *Rev. for. franç.* 11 (7), 1959 (503–17). [F.]

Attributes the almost total lack of regeneration of Oak, Beech and Pine in the forests of the Paris basin to the relentless persecution (by keepers, sportsmen etc.) of the carnivores (foxes, stoats, weasels etc.) and birds of prey (buzzards, owls, kestrels etc.) which would normally keep the populations of small rodents at a harmless level. The forests of Le Valois (Aisne-et-Oise) are adduced as a proof. From 1940 these were in German occupation and hunting licences permitted the shooting only of beasts of chase, the predators being protected. The coincidence of this regulation with some good mast years during the war resulted in abundant natural regeneration which was well established before the introduction of myxomatosis (1952) eliminated the rabbit. It is concluded that the depredations of innumerable small rodents are the most important factor preventing natural regeneration, and that the protection of their predators would go far to ensure adequate regeneration of the forests of this region. The importance of the wild boar and the badger in controlling chafer grubs is also discussed.

666. WUTTKY, K. Ungewöhnliche Mäuseschäden an Pappeln. **[Unusual damage to Poplars by mice.]** *Forst u. Jagd* 9 (4), 1959 (184–5). [G.]

Describes and illustrates crown deformations in a 14-year stand of *Populus* × *marilandica* attributed to the feeding of mice which were observed to climb into the trees for safety during a severe flood when the Poplars were 8 years old and 8 m. high. The species responsible were not identified.

667. ASHBY, K. R. **Prevention of regeneration of woodland by field mice (*Apodemus sylvaticus* L.) and voles (*Clethrionomys glareolus* Schreber and *Microtus agrestis* L.).** *Quart. J. For.* 53 (3), 1959 (228–36). 13 refs.

In a Sessile-Oak/Sycamore-Maple and a young Sycamore-Maple/Larch plantation in Durham, estimates of the rodent population have been made 5 times a year since 1954, and conclusions are drawn on annual cycles of rodent abundance, variations in abundance in different years etc. Experiments showed that the ratio of the rate of removal of peas (used to simulate large tree seed) to the rate of entry of rodents into traps was roughly the same in different places at any given time, but varied with season, being highest in winter. The ratio of Sycamore seed eaten to number of rodents trapped was more variable. It was very much higher where populations were high and during winter. Serious damage was caused to young seedlings; between May and Oct., on a ⅛-acre plot, all but 2 Beech seedlings out of 41 were destroyed, and all but 102 out of 922 Sycamore seedlings. Causes of the excessive populations of small rodents, notably the indiscriminate destruction of predators and the tendency towards pure crops in both agriculture and forestry, are discussed.

668. SCHINDLER, U. Zur Erdmaus-Prognose. **[Forecasting field vole populations.]** *Anz. Schädlingsk.* 32 (7), 1959 (101–6). 18 refs. [G.g.]

The efficiency was compared of two different methods of laying traps for estimating populations of *Microtus agrestis*, using (1) a rectangular plot with traps spaced at regular intervals, and (2) a long row of traps, set at 2-m. intervals, running straight or diagonally across the stand (in natural stands the line may bend to take in samples of all types of vegetation). Method (2) was the more efficient.

669. UDAGAWA, T., MIZUNO, T., and SEKI, M. **[A study of behaviour of the Japanese field vole (*Microtus m. montebelli*) extraordinary [*sic*] increased in late autumn, 1956.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (83–90). [Jap.e.*e.*]

A population study following gregarious flowering of *Sasa phymatonodosa*.

670. UDAGAWA, T., MIZUNO, T., and SEKI, M. **[A field experiment on some rat poisons.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 105, 1958 (1–10). 5 refs. [Jap.jap.e.*e.*]

In control tests on enclosed plots against *Microtus montebelli* which had become injurious to plantations in Central Japan, spraying with endrin 19·5% (3 kg. in 400 litres/ha.) reduced numbers by 97%, Zn_3P_2 and Na fluoracetate on wheat bait by 89 and 87% respectively, and Zn_3P_2 on dough by 54%. [Cf. *F.A.* 15 No. 3770.]

671. HIGUCHI, S., and IGARASHI, B. **[On the basic materials used as poisonous baits for field mice and voles especially during the breeding season.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (73–81). 18 refs. [Jap.e.*e.*]

In all three species tested (*Apodemus geisha, A. ainu ainu*, and *Clethrionomys rufocanus bedfordiae*) there was an increased liking for animal (dried silkworms or dried herring) rather than vegetable baits during the breeding season.

672. TURČEK, F. J. Zur Nahrung des Eichhörnchens—*Sciurus vulgaris fuscoater* Altum 1876 in der Slowakei (ČSR). **[The food of squirrels in Slovakia.]** *Waldhygiene* 3 (1/2), 1959 (50–3). 1 ref. in text. [G.]

Describes observations in forests, arboreta etc. The very varied diet consists largely of seeds, chiefly coniferous, but also of buds, both vegetative and floral, of most conifers and some hardwoods, the succulent galls of *Sacchiphantes viridis* and *Adelges laricis* on Spruce, including the aphids themselves, fungi, fledgeling birds, etc. Barking, including ringing, was noted on Spruce, European Larch, Black Poplar hybrids, and *Sequoia gigantea* (in the last case, probably for nesting material). The loss of seed is not considered important. The effect of bud eating was not clear, but deformations so caused were found on *Abies alba* and *A. firma*.

673. SCHULZ, H.-E. Über Wildschaden in den Revieren der Deutschen Demokratischen Republik. **[Game damage in the forest ranges of the German Democratic Republic.]** *Forst u. Jagd* 8 (11), 1958 (482–8). 5 refs. [G.g.]

[Cf. *F.A.* 18 No. 3052.] Presents in 8 maps and tables the damage done (3 grades) in 1957 by red, fallow and roe deer, pig, mouflon, hares and rabbits, reported by 492 stations covering the 14 districts. Of these stations 14·8% reported none, 33·9 light, 34·6 appreciable and 16·7 severe damage. Particularly notable is the severe bark-scaling damage by red deer to 5- to 15-year Pine. No progress in protection can be achieved until the prevailing excessive densities (e.g. red deer 6/100 ha., roe 15-20/100 ha.) are reduced.

674. EIBERLE, K. Die Wildschadenprobleme im Waldbau. **[Silvicultural problems of game damage.]** *Schweiz. Z. Forstw.* 110 (9), 1959 (585–97). 7 refs. [G.f.]

It is estimated, on the basis of local returns, that the cost of prevention, loss of increment, beating up etc. in fenced and unfenced regeneration areas, plus damage to mature trees, exceeds Fr. 6 million annually for Switzerland (Fr.6·40/ha. of forest). Joint planning by game and forestry authorities is urged, so as to avoid unnecessary destruction of pasture (herbs and shrub layers etc.) and reduce game densities to biologically and economically tolerable levels.

675. BURCKHARDT, D. Über die biologischen Ursachen der Wildschäden im Wald. **[The biological causes of game damage in the forest.]** *Schweiz. Z. Forstw.* 110 (9), 1959 (598–616). 59 refs. [G.f.]

An ecological discussion, including a brief report on feeding investigations on red deer, roe deer and chamois in the Swiss National Park, indicating that roe deer feed more on forest trees than red deer, and suggesting that the bark of standing trees is an emergency food. Densities in most parts of Switzerland are thought greatly to exceed the biological equilibrium (as maintained under natural conditions by carnivores) with serious consequences, not only for economic forestry, but for the whole biotope.

676. SZCZERBIŃSKI, W. Zagadnienie spałowania drzewostanów przez grubą zwierzynę łowną oraz uwagi dotyczące metodyki badania jego skutków w sośninach i świerczynach. **[The problem of barking by game, and methods of studying the effects of the damage in Pine and Spruce stands.]** *Sylwan* 103 (5), 1959 (73–90). 12 refs. [Pol.russ.e.]

Reviews German work on the problem [cf. *F.A.* 14 Nos. 2425–6; 15 No. 3779; 17 No. 4127], and discusses methods of studying and evaluating the damage on individual trees and in stands.

677. HILDEBRANDT, G. Beobachtungen über die Verteilung des Schälschadens in Fichtenbeständen. **[The distribution of bark-scaling damage by deer in Spruce stands.]** *Allg. Forst- u. Jagdztg.* 130 (8/9), 1959 (213–8). 12 refs. [G.g.e.]

An analysis of two reports to owners of private and communal forests in the Eifel region, based on representative sampling. The incidence of damage varied greatly between and within stands, barking often being concentrated on groups of trees, so that the removal of injured stems by thinning is impracticable. In the thicket stage, dominants appeared to be preferred; in the pole stage, all crown classes suffered about equally; and in older stands, the larger stems of dominants and predominants appeared to suffer least.

678. MÜNCH, H. Erwerb der Insektennahrung beim Dachs. **[How badgers forage for insects.]** *Forst u. Jagd* 9 (4), 1959 (164–5). 5 refs. [G.]

Includes a description of a badger tearing off bark and sapwood in a narrow strip ca. 1 m. long, at the bottom of a Spruce stem, in an effort to reach larvae living in the rotten heartwood underneath. The habit is said to be rare and the damage, which is reminiscent of, but distinguishable from, that caused by woodpeckers, is not considered economically important.

679. TURPIN, P. **Equipment for setting out fence posts.** *For. Equipm. Note, FAO* No. *A*.16.59, 1959. pp. 7.

Describes the different types of hole diggers (portable, self-propelled, or tractor-mounted augers, drills or diggers) and post drivers, with photographs and a list of manufacturers.

452. Birds

680. BJOR, K. Storfuglbeiting på granplanter. **[Damage to Spruce plants by capercailzie feeding.]** *Norsk Skogbr.* 5 (12), 1959 (339–40). [Nor.]

[Cf. *F.A.* 17 No. 3615.] The damage to leaders is briefly described and distinguished from that by deer. In a single year, damage is usually slight, but may be serious after repeated feeding. It was particularly heavy in the winter of 1955–56, possibly because of the previous summer's drought.

453. Insects

See also Nos. 646, 1296.

681. PETERSEN, B. B. Hauptprobleme der forstlichen Entomologie in Dänemark (mit besonderer Berücksichtigung der Verhältnisse seit 1923). **[Main problems of forest entomology in Denmark (with special reference to conditions since 1923).]** *Anz. Schädlingsk.* 32 (8), 1959 (113–7). 19 refs. [G.]

A review based on literature.

682. BONGBERG, J. W. **A status report on forest insect conditions in the United States in 1958.** *FAO Plant Prot. Bull.* 7 (7), 1959 (85–98).

Covers conditions (*a*) by regions, and (*b*) by the major insect pests. Conditions were not markedly different from those in 1957 [cf. *F.A.* 20 No. 2044].

683. ALKAN, B. Haselnussschädlinge in der Türkei. **[Pests of *Corylus avellana* in Turkey.]** *Z. angew. Ent.* 44 (2), 1959 (187–202). 18 refs. [G.g.e.] O.H.

Describes insect and other pests injuring Hazelnut plantations (grown for the nuts), chiefly in the Black Sea province of Giserun, including types of injury, economic importance, and control. The more

serious are *Eriophyes avellanae*, *Balaninus nucum*, *Xyleborus dispar*, *Melolontha melolontha* and *Polyphylla fullo*.

684. NISHIGUCHI, C. **[On the communities of *Populus* defoliators and their seasonal change.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (191–8). 19 refs. [Jap.e.]

A study was made on *Populus japano-gigas* throughout the growing seasons of 1956 and 1957, to analyse the communities of defoliators (in the larval stage) and their seasonal change. The most important defoliators were: June *Malacosoma neustria*, July *Lymantria dispar*, August *Melalopha anastomosis*, Sept. and Oct. *Notodonta tritophus*.

685. WETTSTEIN, O. Zur Biologie von Pappelschädlingen in Windschutzstreifen. **[The biology of Poplar pests in shelterbelts.]** *Cbl. ges. Forstw.* 76 (2), 1959 (84–106). 9 refs. [G.]

Reports investigations on shelterbelts in the S. part of the Vienna basin, consisting chiefly of Black Poplar hybrids on dry, loamy soil, in a dry, warm climate, discussing the life history, enemies, injuries inflicted etc. for many pests, including *Leucoma salicis*, *Trochilium apiforme*, *Gelechia pinguinella*, *Phyllocnistis suffusella*, *Zeugophora flavicollis*, *Byctiscus populi*, *Trichiocampus viminalis*, *Pseudoclavelaria amerinae*, *Saperda carcharias*, *S. populnea*, etc. Despite frequent temporary defoliation, control is not considered economic.

686. ACATAY, A. Pappelschädlinge in der Türkei. **[Pests of Poplar in Turkey.]** *Anz. Schädlingsk.* 32 (9), 1959 (129–34). 11 refs. [G.]

Presents brief notes on 3 species of Acarina, 15 Coleoptera and 16 Lepidoptera, their habits, injury caused, and occurrence in Turkey.

687. LI, Y.-C. **[Preliminary results of tests on the use of insecticides to control three species of insects damaging the leaves of Poplars.]** *For. Sci., Peking* 1959 (4), (321–6). 4 refs. [Chin.russ.]

Two-year tests in N.E. China on the control of *Zeugophora scutellaris*, *Leucoptera susinella* (*Cemiostoma sinuella*), and *Phyllocnistis saligna*, showed that spraying with 0·05% malathion, and 0·03% parathion, gave good larval kills (> 90%). Systox at 0·025 and 0·05% was not very effective; 0·03% water suspensions of BHC were ineffective against *P. saligna* larvae, but gave 100% kills of *Z. scutellaris* beetles.

Insects: Natural and Biological Control

See also Nos. 694–5, 705–9, 718–9, 724, 726–8,732, 744–9, 771, 773–4, 780–1, 789.

688. WELLENSTEIN, G. Möglichkeiten und Grenzen des Einsatzes von Krankheitserregern, Nutzinsekten und Vögeln im praktischen Forstschutz. **[The scope and limits of the use of pathogenic agents, useful insects and birds in practical forest protection.]** *Forstwiss. Cbl.* 78 (5/6), 1959 (150–66). 42 refs. [G.]

A general review, mainly of German work, on the biological control of insect pests.

Insects: Chemical Control (General)

See also Nos. 396–7, 687, 692, 707, 716, 720–1, 730–1, 733, 735, 742–3, 761–2, 768–9, 783, 789–90.

689. **Beaconing in aerial application.** *Agricultural Aviation, The Hague* 1 (3), 1959 (66–70). 1 ref. O.R.E.

Discusses methods for use in agriculture and forestry. Balloons and flags can be used for marking the boundaries of areas to be treated, and for dividing the area into strips. Painting or powdering the crowns to act as beacons is unsatisfactory.

690. HOPEWELL, W. W. **Evaporation rates of small drops of two DDT oil solutions.** *Canad. J. Pl. Sci.* 39 (2), 1959 (204–9 + 1 plate). 8 refs. O.R.E.

Evaporation losses were measured from droplets of (*a*) DDT in methylated naphthalene solvent and fuel oil, as used in aerial spraying against *Choristoneura fumiferana*, and (*b*) DDT in base oil + diesel oil, as against *Acleris variana*. Results indicated that drops of (*a*) $\leqslant 75\mu$. diam. would probably be reduced to $\leqslant \frac{1}{2}$ their original volume in falling 100 ft. Drops of (*b*) were far less volatile.

Orthoptera

691. POPOV, G. **Some notes on injurious Acrididae (Orthoptera) in the Sudan-Chad area.** *Ent. mon. Mag.* 95 (1139), 1959 (90–2). 4 refs.

Includes a note on the tree locust *Anacridium melanorhodon melanorhodon* found principally on species of *Acacia*, *Balanites* and *Zizyphus*. Damage to trees, particularly *Balanites* spp., *A. mellifera* and *A. senegal*, was considerable and the insect, which appears to be increasing, is considered a serious threat to agriculture. It appeared to be largely confined to the denser parts of Acacia/short-grass savanna and mixed deciduous woodland zones.

Isoptera

692. PARRY, M. S. **Control of termites in *Eucalyptus* plantations.** *Emp. For. Rev.* 38 (3), 1959 (288–92). 2 refs.

Trials with various *Eucalyptus* species in dry areas of Tanganyika indicated that powdered insecticides, mixed with the plant-hole soil, effectively controlled termites (species not identified) in the first year; in the 2nd and 3rd years mortality was insignificant even in untreated controls. γ-BHC appeared to be more effective than aldrin or dieldrin at the same cost, $\frac{1}{4}$ to $\frac{1}{2}$ oz. per plant of any commercial γ-BHC preparation of 0·5 to 6·5% concentrations (costing 15*s.*/ acre) being recommended for field use. In trials to test the effect of weed competition on growth and termite attack, clean weeding greatly increased height growth and vigour compared with spot weeding. A somewhat greater mortality from termites in the first year was offset later by less dry-season mortality.

Hemiptera

See also Nos. 46–7.

693. SCHEFER-IMMEL, V. Die Zikade *Idiocerus decimaquartus* Schrk. als Pappelschädling. **[*I. decimaquartus* as a pest of Poplar.]** *Anz.*

Schädlingsk. 32 (10), 1959 (150–5). 14 refs. [G.]

Presents data on biology and life history, based on observations made during a severe outbreak in 1958–59 in Frankfurt.

694. CAMPBELL, K. G., and MOORE, K. M. **An investigation of the food of the bell bird *Manorina melanophris* Lathem.** *Repr.* from *Proceedings of the Royal Zoological Society of New South Wales, Sydney 1955/56*, 1957 (72–3). 1 ref.

Stomach analyses indicate that in the Wyong-Gosford area, where psyllids, chiefly *Spondyliaspis* spp., attack Eucalypts, these and their larvae with their "lerps" (protective dome-shaped coverings) form a main part of the birds' diet, but other insects, including predatory syrphids, were also eaten.

695. FRANZ, J. M. **Studies on *Laricobius erichsonii* Rosenh. (Coleoptera: Derodontidae), a predator on chermesids.** *Entomophaga, Paris* 3 (2), 1958 (109–96 + 2 plates). 41 refs. [E.e.g.] O.H.

Part I of this monograph covers distribution in Europe, including climatic limiting factors, life history, ecology, behaviour etc. (based chiefly on observations in Silver Fir stands infested with *Adelges piceae* in Bavaria, within the natural range of Silver Fir), and economic importance. From a comparison of egg consumption by *L. erichsonii* larvae and adults (estimated at ca. 3000 in a life-time) and egg production of the aphid (ca. 60,000 p.a. on 100 sq. cm. of bark) it is concluded that this insect alone could not suppress heavy outbreaks. On the other hand its limited host specificity enables it to spread to isolated outbreak areas. Part II describes the external anatomy of all stages.

696. MINKO, G. **An adelgid on Monterey Pine in the Ovens Plantations [, Victoria].** *For. tech. Pap. For. Comm. Vict.* No. 1, 1959 (19–23). 8 refs.

Describes the life history of, damage caused by, and association of *Diplodia pinea* with, *Pineus boerneri* in *Pinus radiata* plantations. It was found that 75% of trees infested with *P. boerneri* were also infected with *D. pinea*, and the possibility of the fungus being spread by the insect is considered.

697. GLEISS, H. G. W. Beiträge zur Kenntnis des Wirtspflanzenspektrums mitteleuropäischer Blattläuse (Homopt., Aphidina). **[The range of host plants attacked by central European aphids.]** *Anz. Schädlingsk.* 32 (9), 1959 (136–8). 17 refs. [G.]

Short notes on new hosts for 15 aphid species.

698. KLOFT, W., and EHRHARDT, P. Untersuchungen über Saugtätigkeit und Schadwirkung der Sitkafichtenlaus *Liosomaphis abietina* (Walk.) (*Neomyzaphis abietina*). **[Studies on the sucking activity and damage caused by *N. abietina*.]** *Phytopath. Z.* 35 (4), 1959 (401–10). 14 refs. [G.g.e.] O.R.S.

N. abietina was bred and studied on 5- to 6-year Sitka Spruce in long-day conditions in the laboratory. Attack is through the stomata; the insect pierces the parenchyma and sucks the central phloem, and is thus able to produce honeydew. Seven amino acids were found in the saliva of adults. The mean time between the piercing of the needle and the appearance of chlorotic flecks was 5–6 days for larvae, 8–10 for adults. The uptake of P^{32} in these chlorotic spots was considerably below that of the healthy green parts of the needles. Respiration was increased and photosynthesis decreased in the damaged needles.

699. DOANE, C. C. **The Red Pine scale [*Matsucoccus resinosae*].** *Circ. Conn. Agric. Exp. Sta.* No. 207, 1959. pp. 7. 3 refs.

Summarizes existing knowledge on this serious pest of *Pinus resinosa* in Connecticut, including other hosts, distribution, injuries, life history and habits, and control.

Lepidoptera

See also Nos. 48, 475, 1251.

700. MOORE, K. M. **Observations on some Australian forest insects. 3. The biology and larval taxonomy of some Lepidoptera attacking trees and timber.** *Repr.* from *Australian Zoologist, Sydney* 12 (4), 1959 (337–50 + 3 plates). 12 refs.

Describes, with notes on habits, biology, hosts, distribution, parasites etc., various insects of potential economic importance whose larvae feed on wood (usually sapwood, occasionally heartwood) in standing trees, building timbers, fence posts etc., mostly under conditions of dampness and decay. The predominating genus *Barea* (Oecophoridae) was represented by 7 species, of which the most widespread and numerous, *B. consignatella*, is described in greater detail. In addition, *Tinea diaphora*, and *Hieroxestis omoscopa* (Lyonetiidae), are also described. Hosts include *Eucalyptus* spp., *Angophora intermedia*, and *Podocarpus dacrydioides*.

701. OLDIGES, H. Der Einfluss der Temperatur auf Stoffwechsel und Eiproduktion von Lepidopteren. **[The effect of temperature on metabolism and egg production in Lepidoptera.]** *Z. angew. Ent.* 44 (2), 1959 (115–66). 97 refs. [G.g.e.] O.H.

Reports laboratory experiments with 5 species, including *Lymantria monacha*, *Panolis flammea* and *Bupalus piniarius*, with data on metabolic rate, food intake, resulting pupal weights, egg numbers etc.

702. TALLOS, P. Két fenyöföi erdötípus lepketársulásainak vizsgálata, tekintettel a károsítókra. **[Lepidoptera associations in two forest types in Fenyöfö, with regard to the harmful species.]** *Erdész. Kutatás., Budapest* 1958 (1/2), (215–32). 16 refs. [Hu.russ.e.g.]

Lists, by species and numbers, the Lepidoptera found in (1) a natural, healthy Pine stand on a dry site and (2) a Pine plantation established on a poor Pine site, formerly Oak/Hornbeam. The numbers of Lepidoptera found in the different storeys, and species characteristic of each site are tabulated. No damage was found in (1); in (2) damage was not yet serious, but harmful Lepidoptera were present in sufficient numbers to indicate that re-conversion to broadleaved forest would be advisable.

703. TOMIĆ, D. Prilog poznavanju ciklusa razvića malog topolinog staklokrilca. **[The life-history of *Sciapteron tabaniforme*.]** *Zašt. Bilja*

No. 49/50, 1958 (87–94 + 1 plate). 7 refs. [Serb.e.] I.M.I.

Presents data on the life history of *S. tabaniforme* damaging White Poplar, particularly in the region of Vojvodina. All ages are attacked, but most frequently 2- to 5-year-old trees. Stems, particularly the lower part, suffer more than branches, though heavy attack on branches has been observed in old, overdense stands. *From author's summary.*

704. YANG, Y.-C., *et al.* **[Preliminary investigations on the small Poplar aegeriid (*Paranthrene tabaniformis* Rtt.) in the environs of the city of Peking.]** *Acta Entomologica Sinica, Peking* 7 (1), 1957 (89–104 + 18 drawings, 7 photos). 8 refs. [Chin.chin.russ.] I.I.E.

Many Poplars used in shelterbelts (*Populus alba, P. tomentosa, P. simonii, P. cathayana, P. 'canadensis'* and *P. nigra* var. *italica*) are attacked by *Sciapteron tabaniforme.*

705. MILLER, C. D. F. **A new species of *Copidosoma* closely related to *C. nanellae* Silvestri (Hymenoptera: Encyrtidae).** *Pan-Pacific Entomologist, San Francisco* 34 (2), 1958 (57-61). 2 refs. I.I.E.

C. deceptor sp. nov., found parasitizing *Recurvaria* spp.

706. STRUBLE, G. R., and MARTIGNONI, M. E. **Role of parasites and disease in controlling *Recurvaria milleri* Busck.** *J. econ. Ent.* 52 (3), 1959 (531–2). 7 refs.

A short review of literature, followed by an account of the natural control of *R. milleri* by a granulosis virus.

707. STEVENS, R. E. **Biology and control of the Pine needle-sheath miner, *Zelleria haimbachi* Busck.** *Tech. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 30, 1959. pp. 20. 11 refs.

In early summer 1956 a severe infestation of *Z. haimbachi* occurred at the Institute of Forest Genetics, Placerville. Data from 2 years' studies are presented on distribution and hosts (mainly Ponderosa, Jeffrey and Jack Pine) life history, habits, parasitization (an important natural control mechanism) and experimental control measures. Spraying with malathion gave 99% control.

708. **Oak leaf miner (*Lithocolletis messaniella* Zell.).** *Extr.* from *Rep. Dep. Sci. Industr. Res. N.Z. 1958/59*, 1959 (17).

This introduced insect has caused much damage to the foliage of Oaks in New Zealand since 1951 [cf. *F.A.* 15 No. 3801] and has been noted also on native Beech (*Nothofagus* spp.). Two parasites [not specified] have now been introduced in Nelson and after a year ca. 74% parasitization was found.

709. STARK, R. W. **Parasites of *Petrova metallica* Busck.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (3), 1959 (2).

The following parasites were reared and identified: *Hyssopus benefactor, Phrynofrontina* sp., *Amblymerus* sp., *Calliephialtes comstockii, Campoplex* aff. *conocola, Pimplopterus* sp., and *Scambus* sp.

710. MARTIN, J. L. ***Rhyacionia adana* Heinrich, a Pine tip moth in Ontario.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (3), 1959 (1).

R. adana was described in 1923, but its host plants were unknown until 1957, when it was found feeding on *Pinus resinosa, P. sylvestris* and *P. banksiana* in Ontario. Further study has shown it to be common in most of S. and Central Ontario, where it feeds on young Pines up to 3 ft. in height. It has probably been overlooked in the past through confusion of its damage with that caused by *R. buoliana.*

711. NEF, L. Étude d'une population de larves de *Retinia buoliana* (Schiff.). **[A population study on *Rhyacionia buoliana* larvae.]** *Z. angew. Ent.* 44 (2), 1959 (167–86). 8 refs. [F.g.e.]

Reports on a study in a 5-year-old Pine plantation near Limburg, Belgium. The statistical distribution of the larvae was found to be very close to the Pascal (negative binomial) function. A 10% sample gave a good estimate of its mean and of the parameter, a random sample being more accurate than a systematic (coefficients of variation 4·6 and 10·7%). The numbers of terminal buds and of branches and terminal endings of the top whorl were linearly related to height, as were larval densities, the terminal shoots of the tallest trees being the most heavily attacked. However, other factors, such as the proximity of a mature stand, appeared to be involved, perhaps by influencing parasite populations, or by initial desiccation of the young Pine, and the existing gradients in height growth and in infestation densities did not coincide.

712. FLINK, P. R., and BRIGHAM, P. M. **Preliminary report on Red Pine nursery stock fumigation.** *J. For.* 57 (9), 1959 (662–3).

To prevent the dispatch of living *Rhyacionia buoliana* larvae in stock from a Michigan nursery, chambers were built for fumigating dormant stock with MeBr gas before dispatch. At temperatures > 50° F., dosages of 4 lb. pure MeBr/1000 cu. ft. were sufficient to kill the larvae. Mortality was the same for plants treated once as for untreated stock. Terminal growth was almost the same as in untreated stock. Jack Pine appeared less and Spruce more susceptible to MeBr injury than Red Pine.

713. MAKSYMOV, J. K. Beitrag zur Biologie und Ökologie des grauen Lärchenwicklers *Zeiraphera griseana* (Lepidoptera, Tortricidae) im Engadin. **[The biology and ecology of *Semasia diniana* in the Engadine [Grisons].]** *Mitt. Schweiz. Anst. Forstl. Versuchsw.* 35 (3), 1959 (277–315 + 16 photos). 41 refs. [G.g.f.it.e.]

Summarizes results of field and laboratory observations into bionomics, temperature relations etc. of the Larch form of the insect [cf. *F.A.* 20 No. 4874]. Moths were found to be capable of crossing the highest peaks in active or passive flight.

714. SIMEONE, J. B., and ENGELKEN, J. H. **Injury to coniferous tree seedlings by the oblique-banded leaf roller [*Archips rosaceana*].** *J. For.* 57 (7), 1959 (492–4). 6 refs.

A report of damage in a New York nursery in 1956–58, by *A. rosaceana*, which has only once

before been recorded as damaging a conifer [see *F.A.* 19 No. 4508]. Seedlings of *Pinus strobus*, *P. sylvestris* and *P. resinosa* were most affected, *P. banksiana*, *P. nigra*, *Abies concolor*, *Pseudotsuga taxifolia*, *Larix leptolepis*, *Picea glauca* and *P. abies* less so. Some other conifer seedlings were not attacked. Food did not appear to be the primary attraction, and it is thought that the larvae were seeking suitable places for pupation. Mowing of clover in idle beds near by, or removal of the original host plants by weeding are thought likely to have caused the attack. Some chemical sprays are discussed, which may be useful if control should become a necessity.

715. TERRELL, T. T. **Sampling populations of overwintering Spruce budworm in the northern Rocky Mountain region.** *Res. Note Intermt. For. Range Exp. Sta.* No. 61, 1959. pp. 8.

An account of studies on overwintering larval populations during large-scale control operations in 1956 and 1957. The larvae were brought out of hibernation by taking infested bole sections or billets after several weeks at low temperatures and transferring them to a warm room in a sealed container. In the end of the container was a glass vial which admitted light and towards which the arvae migrated and were counted on emergence from hibernation. Studies of different variables showed that: (1) Samples collected from northern or southern slopes yielded higher populations than those from valley bottoms; (2) hibernating larvae were more numerous per unit of bark surface on tree boles than on limbs; and (3) five bole sections were required from each sampling point for an adequate sample. The numbers of larvae found on material collected in autumn and stored was only ¼ that found on fresh material from the same sites.

716. WEBB, F. E. **Aerial control of forest insects with reference to the Canadian situation.** *Repr.* from *Canadian Fish Culturist, Ottawa* No. 24, 1959. pp. 14. 19 refs.

A review of progress, from the literature, concerned mainly with control of the Spruce budworm.

717. BASHAM, J. T. **Studies in forest pathology. XX. Investigations of the pathological deterioration in killed Balsam Fir.** *Canad. J. Bot.* 37 (2), 1959 (291–326 + 3 plates). 38 refs. O.R.S.

[Cf. *F.A.* 18 Nos. 651, 1873.] Experiments were made to assess the significance and interrelationships of 5 fungi consistently associated with the deterioration of Balsam Fir killed by Spruce budworm, and to explain the succession pattern of the fungi, viz. a yeast, *Ophiostoma bicolor*, *Stereum chailletii*, an unidentified hyphomycete ('Fungus F') and *Polyporus abietinus*. It is suggested that the succession pattern may depend principally upon changes in certain properties of the wood substrate, particularly the moisture content of the sapwood.

718. HENZE, O., and GÖRNANDT, H.-J. Die Nahrung höhlenbrütender Singvögel in einem Eichenwickler-Schadgebiet. **[The food of hole-nesting songbirds in an area infested by *Tortrix viridana*.]** *Forstwiss. Cbl.* 78 (7/8), 1959 (212–31). 40 refs. [G.g.]

In a forest area of 332 ha., partly composed of pure Oak, investigations were made on the food of nestlings of 9 species of hole-nesting birds (the most frequent being *Parus* spp.) and of 2 ground-nesting species. Samples of food were obtained from the nestlings by the 'neck-ring' technique used by the Chinese with cormorants for fishing. Details of the food of the various species are tabulated. *P. caeruleus* and *P. major* were the most important species, *T. viridana* forming 50·3 and 32·3% respectively of their food, in the first brood. The results of this investigation are held to justify intensive bird protection in areas where *T. viridana* is a menace, i.e. provision of nesting sites, drink and food in winter, cleaning and maintenance of nest boxes, and the control of avian and mammalian predators.

719. BURGERJON, A., and KLINGLER, K. Détermination au laboratoire de l'époque de traitement de *Tortrix viridana* L. avec une préparation à base de *Bacillus thuringiensis* Berliner. **[Laboratory tests to determine the best time for applying a *B. thuringiensis* inoculum to *T. viridana*.]** *Entomologia Experimentalis et Applicata, Amsterdam* 2 (2), 1959 (100–9 + 2 photos). 11 refs. [F.f.g.] O.H.

Describes preliminary tests with suspensions of spore powder and crystals, in 4 concentrations, in 30 c.c. water applied to Oak twigs with ca. 40 buds each, at intervals of 2–3 days. The twigs were then placed in the laboratory at 22° C. and evaluated by comparing numbers of live larvae about 11 days later with those on controls, which had by that time been defoliated. Treatment when hatching commenced and buds were closed was not effective. Results improved when newly hatched larvae were present on buds whose scales had slightly opened, but were less good once the larvae had burrowed into the still closed buds. Best results were obtained during the period of bud break and leaf flushing. Once the leaves were fully developed, only the strongest concentrations gave results.

720. KALANDRA, A., and KOLUBAJIV, S. Ruční pulsacní zamlžovač v boji proti obaleči dubovému *Tortrix viridana* L. v polesí Žebětín u SLH Veveří v roce 1955. **[A hand-operated aerosol pulsation-generator for *T. viridana* control in the Žebětín and Veveří state forests in 1955.]** *Věd. Práce Vyzkum. Ust. Lesa Mysl., Praha* No. 1, 1957 (103–22). 40 refs. [Cz.russ.g.]

Following successful trials in 1953–54 using horse-drawn and tractor-mounted aerosol-blowers [cf. *F.A.* 19 No. 3210], a week's trials were held in May 1955 in calm, cold weather (max. temperature 15° C., min. 1°) with a portable, hand-operated aerosol generator, for *T. viridana* control in Oak. Two 1-ha. forest plots were selected and 10% oil solutions of (*A*) DDT and (*B*) BHC respectively applied at 4 kg./ha., the incidence of *T. viridana* being established as 2·84 and 2·29 per bud. Aerosol effectiveness was assessed by counting the number of dead or live larvae remaining on the test trees 5 days after application, and kills of ca. 80 and 2% were obtained on plots (*A*) and (*B*) respectively,

emphasizing the clear-cut superiority of the DDT aerosol. Greater ease of handling at a relatively early stage of *T. viridana* larval development (i.e. generally before the end of the hibernation of useful forest insects whose losses were consequently > 0·4–0·9%), was another advantage of the portable unit over the larger mounted or trailed blower.

721. TORRENT, J. A. La nueva técnica de tratamiento contra las plagas del encinar y su importancia económica. **[New method of controlling pests of *Quercus ilex* and its economic significance.]** *Bol. Serv. Plagas For., Madrid* 2 (3), 1959 (11–35). [Span.]

Reviews the most important pests of *Quercus ilex* in Spain, gives an estimate of the damage caused, and reports on experiments in spraying and dusting, undertaken by the Servicio de Plagas Forestales. These were directed mainly against *Tortrix viridana*. A 10% DDT dusting with a 2-man portable appliance was considered the most effective control measure. A summary is given of control work done over the years 1953–58. Economic aspects and secondary effects of the dusting are also discussed.

722. LUIS BORDONS, J. Las plagas de la piña de *P. pinea* en Valladolid. **[Pests of cones of *Pinus pinea* in Valladolid.]** *Bol. Serv. Plagas For., Madrid* 2 (3), 1959 (47–65). [Span.]

Describes damage caused to cones, and the insects producing it, chiefly *Dioryctria* spp. and *Pissodes validirostris*, with notes on their biology.

723. RENNELS, R. G. **The possibility of evergreen bagworm [*Thyridopteryx ephemeraeformis*] dispersal on infected Christmas trees.** *For. Note Ill. Agric. Exp. Sta.* No. 87, 1959. pp.2.

The study indicates that bagworm eggs subjected to indoor conditions on cut Christmas trees are capable of hatching after outside exposure to winter and spring temperatures, and that hatching occurs in advance of the normal hatch in the field.

724. MOORE, K. M. **Observations on some Australian forest insects. I. Notes on the biology of the sawfly *Polyclonus atratus* Kirby 1882 (family Pergidae, subfamily Euryinae) and some of its parasites. II. A biting midge (Diptera: Ceratopogonidae) and mortalities among larvae of Lepidoptera (Limacodidae).** *Repr.* from *Proceedings of the Royal Zoological Society of New South Wales, Sydney* 1955/56 (1957), (74–81); 1956/57 (1958), (77–8). 11 refs.

(I) *P. atratus* larvae feed on dying or dead leaves of *Eucalyptus* and *Angophora* spp. (II). *Forcipomyia fuliginosa*, attacking larvae of *Doratifera casta* (a defoliator of *Eucalyptus* and *Angophora* spp.), is believed to transmit a virus disease that kills many larvae.

725. LIU, Y.-C., YIN, H.-F., and TSEN [CH'ÊN], S.-C. **[Preliminary observations on the bionomics of *Dendrolimus punctatus* Walker in the Province of Hunan.]** *Acta Entomologica Sinica, Peking* 7 (1), 1957 (21–51). 3 refs. [Chin.chin.russ.] I.I.E.

A pest of *Pinus massoniana*. Damage is most severe on young trees and in pure stands, but is not often lethal even when attack is heavy.

726. LUNG, C.-T., *et al.* **[A preliminary biological study of two egg parasites of the Pine caterpillar.]** *Acta Entomologica Sinica, Peking* 7 (3), 1957 (261–84). 8 refs. [Chin.chin.e.] I.I.E.

Describes two egg parasites (*Telenomus dendrolimusi* and *T.* sp.) of *Dendrolimus punctatus*, and their parasitism under field conditions. The effect of cold storage on both eggs and parasites is discussed.

727. P'ENG, C.-W. **[A preliminary study on *Dendrolimus punctatus* in Hunan Province, China.]** *For. Sci., Peking* 1959 (3), (183–212). 7 refs. [Chin.e.]

A detailed account of the life history of the insect, based on investigations in 1954–57, including predators and parasites (8 spp. on eggs, 6 on larvae), with some information on prediction of outbreaks.

728. LIU, Y.-C., and SHIH, C.-H. **[Preliminary study on the life history of the Larch caterpillar *Dendrolimus sibiricus* Tschetw. (Lepidoptera, Lasiocampidae).]** *Acta Entomologica Sinica, Peking* 7 (3), 1957 (251–60). 3 refs. [Chin.chin.e.] I.I.E.

Attacks many conifers, but particularly prefers *Larix olgensis*, which is sometimes severely injured. In addition to its life history, some of its parasites are described.

729. PARAMONOV, A. **A possible method of estimating larval numbers in tree crowns.** *Ent. mon. Mag.* 95 (1139), 1959 (82–3). 9 refs.

The method consists in the collection of the head capsules shed by the larvae at ecdysis. Recent studies on *Bupalus piniarius* infesting Corsican Pine at Thetford Chase, using metal funnels of ¼-sq. yd. collecting area, supported at ca. 3 ft. from the ground, indicated that even the minute first-instar head capsules can be separated from other material collected in the funnels by flotation in water.

730. **Elm spanworm [*Ennomos subsignarius*].** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1958*, 1959 (39–40).

Growth studies in connexion with the severe infestation now affecting 570,000 acres in Tennessee, N. Carolina, and Georgia, indicated that severely defoliated Elms grew at ca. ½ their normal rate in a year when *Liriodendron tulipifera*, which is immune, grew normally. Pilot tests in May with aerial spraying of 1 lb. DDT in 1 gal. kerosene/acre, on plots at 3 altitudes, gave complete control at the 2400- and 3200-ft. levels where larvae and foliage were in early stages of development, but less at 1700 ft., where both were more advanced.

731. PETRIK, C. Dosadašnji rad na ispitivanju i suzbijanju dudovca u Vojvodini. **[Investigations on, and control of *Hyphantria cunea* in Vojvodina.]** *Zašt. Bilja* No. 49/50, 1958 (183–92). 10 refs. [Serb.e.] I.M.I.

Presents data on the history of outbreaks of *H. cunea* in Vojvodina, phenological data, feeding habits, and the results of mechanical and chemical control measures. *From author's summary.*

732. VAGO, C., and VASILJEVIC, L. Polyédrie cytoplasmique chez l'écaille fileuse (*Hyphantria cunea* Drury, Lep., Arctiidae). **[A cytoplasmic polyhedrosis in *H. cunea*.]** *Entomophaga, Paris* 3 (2), 1958 (197–8). [F.] O.H.

Describes a virus disease found in larvae from Jugoslavia, which differs from the *Borrelina* type previously reported [cf. *F.A.* 15 No. 3810] and is diagnosed as one of the *Smithia* group.

733. ***Euproctis terminalis* control.** *Extr.* from *Rep. Dep. For. S. Afr. 1956/57*, 1959 (13).

An infestation of *E. terminalis* that was causing severe defoliation to Pine plantations was successfully controlled by aerial spraying with DDT at an inclusive cost of 19*s.* 6*d.*/acre.

734. EATON, C. B., and STRUBLE, G. R. **The Douglas-Fir tussock moth in California (Lepidoptera: Liparidae).** *Pan-Pacific Entomologist, San Francisco* 33 (3), 1957 (105–8). 8 refs. I.I.E.

The tussock moth that periodically defoliates White Fir (*Abies concolor*) forests in California is now considered to be *Hemerocampa pseudotsugata* rather than *H. osleri* as was previously supposed.

735. DAFAUCE, C. Notas sobre *Stilpnotia salicis* L. en España. **[Notes on *Leucoma salicis* in Spain.]** *Bol. Serv. Plagas For., Madrid* 2 (3), 1959 (41–6). [Span.]

Notes on biology and life history. The best times to carry out control measures are the second fortnight in April (usually 15th–20th) for the first generation, and the middle of July for the second generation. Excellent results have been obtained from dusting with 10% DDT for larvae > 1 cm. long and with 10% DDT + 2% lindane for larvae 1–2 cm. long.

736. STEFANOV, D., KEREMIDČIEV, M., and VĂTOV, V. Izsledvane gradiciite na găbotvorkata (*Lymantria dispar* L.) i prăstenotvorkata (*Malacosoma neustria* L.) u nas ustanovjavane na tehnite pričini. **[Investigation of outbreaks of *L. dispar* and *M. neustria* in Bulgaria, and their causes.]** *Nauč. Trud. Lesoteh. Inst., Sofia* No. 6, 1958 (135–72). 28 refs. [Bulg.bulg.g.]

The outbreak areas are mapped from investigations during 1945–57. *L. dispar* is found up to 1300 m.alt., but as a pest is confined to the Oak zone and altitudes > 800 m. *M. neustria* is found only in the Oak zone up to 600 m.alt. High temperatures and low rainfall in April, May and June are of prime importance in causing the outbreaks, and wind helps to spread the pests. The condition of the forests as a predisposing factor, and natural control, are also discussed. Denser, uneven-aged, mixed stands are recommended to reduce the danger of outbreaks.

737. ELIESCU, G., and DISSESCU, G. Raportul dintre mărimea pupelor femele şi numărul de ouă la femelele de *Porthetria dispar* L. **[Relation between the dimensions of female pupae and number of eggs of the female of *P.* [*Lymantria*] *dispar*.]** *An. Inst. Cerc. Silv., Bucureşti* (*Ser. I*) 18, 1957 (77–93). 2 refs. [Rum.russ.f.]

A correlation was established between the weight of the pupa and number of eggs laid, represented by a straight-line equation $y = 0{\cdot}497x - 104$, where y = number of eggs and x = weight of pupa in mg., i.e. an increase of 1 mg. in weight is likely to represent an increase of 0·49 in number of eggs.

738. MAKSIMOVIĆ, M. Eksperimentalna istraživanja o dejstvu temperature na individualno razviće i populacionu dinamiku gubara (*Liparis dispar* L.). **[Experimental research on the effect of temperature on development and on population dynamics of *Lymantria dispar*.]** *Posebna Izd. Biol. Inst. N. R. Srbije* No. 3, 1958. pp. 115. 43 refs. [Serb.e.russ.]

Presents detailed results of experiments on the effect of temperatures at different stages, concluding that although 32° C., the highest of the temperatures studied, gave the most rapid development through all stages, the optimum for the sex ratio and fecundity of ♀s occurred at 16° and that this is probably the optimum for population increase.

739. MAKSIMOVIĆ, M. Prilog istraživanju brojnosti gubara metodom klopke. **[Investigations into the size of gypsy moth populations by the trap method.]** *Zašt. Bilja* No. 49/50, 1958 (41–7). 10 refs. [Serb.e.] I.M.I.

Summarizes methods used at the Belgrade Institute for Forest Research.

740. ZEČEVIĆ, D. Dnevna potrošnja hrane gusenica gubara na hrastu i *Pyracantha coccinea*. **[Daily food consumption of *Lymantria dispar* larvae on Oak and *P. coccinea*.]** *Zašt. Bilja* No. 49/50, 1958 (23–33). 5 refs. [Serb.e.e.] I.M.I.

Laboratory experiments with (1) *Quercus robur* and (2) *P. coccinea* foliage showed that the larval stage was a little shorter and the pupal stage a little longer on (1) than on (2). The length, width and weight of pupae were markedly greater when larvae were fed on (1) and ♀s laid more eggs, though the number of unfertilized eggs was somewhat greater also. Daily food consumption was very variable with both (1) and (2). A definite preference was shown for (1), amounts consumed being considerably higher. Food consumption also increased with the age of the larvae. Figures are presented for area of leaf surface consumed and it is suggested that this could be a criterion in forecasting the intensity of outbreaks. *From author's summary.*

741. JANKOVIĆ, L. Prilog poznavanju biljki hraniteljki gubara u prirodi u toku poslednje gradacije (1953–1957 god.). **[Gypsy moth host plants during the course of the last epidemic (1953–57).]** *Zašt. Bilja* No. 49/50, 1958 (35–9). 14 refs. [Serb.e.] I.M.I.

The number of host plants increased with the progress of the epidemic, reaching a total of 176, of which 33 were forest trees, 7 fruit trees and 19 shrubs. *From author's summary.*

742. GROZDANOVIĆ-SIMIĆ, J. Ponašanje gubara u tretiranoj šumi. **[Behaviour of gypsy moth in treated forests.]** *Zašt. Bilja* No. 49/50, 1958 (49–54). 3 refs. [Serb.e.] I.M.I.

Presents the results of estimates of populations, observations on reduction in populations through

climatic factors before spraying, and the effects of the spraying itself. *From author's summary.*

743. BALARIN, I. Utjecaj nekih insekticida na jaja gubara. [**Effect of some insecticides on eggs of *Lymantria dispar*.**] *Zašt. Bilja* No. 49/50, 1958 (55–9). [Serb.g.*g.*] I.M.I.

Presents tabulated results of spraying with DDT, BHC, H_3PO_4 esters and systemic insecticides. *From author's summary.*

744. VASIĆ, K. Uporedna analiza toka gradacije gubara 1946–1950 i 1953–1957 godine. [**Comparative analysis of the respective courses of the *Lymantria dispar* epidemics of 1946–50 and 1953–57.**] *Zašt. Bilja* No. 49/50, 1958 (9–22). 12 refs. [Serb.e.*e.*] I.M.I.

Presents comparative data on the course of the two outbreaks in Jugoslavia, with observations on temperature and precipitation. In outbreak (1), lack of food was a major factor in reducing populations and parasitization was more frequent. In outbreak (2), polyhedral disease was in many places the deciding factor. Both outbreaks followed the same general pattern. *From author's summary.*

745. MASNER, L. **A new egg-parasite of gipsy moth, *Lymantria dispar*.** *Entomophaga, Paris* 3 (1), 1958 (39–44). 16 refs. [E.e.f.] O.H.

Describes *Hadronotus lymantriae* sp. nov. reared from eggs collected in E. Slovakia, discussing its systematics and giving a key to the 3 known scelionid egg parasites of *L. dispar*. *From author's summary.*

746. BILIOTTI, E. Observations épizootiologiques sur le processionnaire du pin. [**Epizootic notes on the Pine processionary moth.**] *Rev. Path. vég.* 38 (2), 1959 (149–55). 9 refs. [F.e.] I.M.I.

Presents notes on the most important phases in the life history of *Thaumetopoea pityocampa* from the point of view of sampling, and briefly reviews pathogenic agents controlling populations.

747. BILIOTTI, E. Les parasites et prédateurs de *Thaumetopoea pityocampa* Schiff. (Lepidoptera). [**Parasites and predators of *T. pityocampa*.**] *Entomophaga, Paris* 3 (1), 1958 (23–34). 20 refs. [F.e.] O.H.

Lists 8 parasites of eggs (*a*), 19 of larvae and pupae (*b*), 4 insect (*c*) and 3 bird predators (*d*) and 2 hyperparasites (*e*), among which 4 of (*a*), 8 of (*b*), 3 of (*c*) and both of (*e*) were observed in France, and briefly discusses their life histories, roles in controlling pest densities, and potential use in biological control.

748. VAGO, C. Virose intestinale chez la processionnaire du pin *Thaumetopoea pityocampa* Schiff. (Lepidoptera). [**An intestinal virosis of *T. pityocampa*.**] *Entomophaga, Paris* 3 (1), 1958 (35–7). 4 refs. [F.] O.H.

Describes a cytoplasmic virus disease belonging to the *Smithia* virus group, in addition to the intranuclear type earlier reported [cf. *F.A.* 17 No. 4194].

749. GRISON, P. **Aerial distribution of a pathogenic preparation against the processionary caterpillar.** *Agricultural Aviation, The Hague* 1 (2), 1959 (39–41). 5 refs. [E.] O.R.E.

A brief account of the control of *Thaumetopoea pityocampa* in 65 ha. of Austrian Pine in France by a cytoplasmic virus, dispersed as a dust from a helicopter. Two months later ca. 15% of the larvae were dead and 57% of the survivors showed symptoms of the disease.

Coleoptera

See also Nos. 49–52, 441, 593, 722, 1102, 1173.

750. RUCKES, H., JR. **A synopsis of the California deathwatch beetles of the genus *Ernobius* Thomson, with descriptions of two new species which attack Pine cones.** *Pan-Pacific Entomologist, San Francisco* 33 (4), 1957 (157–61). 3 refs. I.I.E.

E. melanoventris and *E. pinicola* spp. nov.

751. ROSE, A. H., and SMEREKA, E. P. **Notes on the American Aspen beetle.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (3), 1959 (1).

Notes on life history and morphology of *Gonioctena americana*, a defoliator of *Populus tremuloides*.

752. CURRY, S. J., and GRIFFITHS, J. F. **Temperature changes within Cypress logs in the Kenya highlands.** *Ecology* 40 (3), 1959 (490–1).

Temperature measurements, taken within seasoned and freshly felled Cypress [*Cupressus lusitanica*] logs under various conditions, showed that seasoned timber reached much higher temperatures than green wood, values of well over 130° F. being recorded. The thermal gradient within the logs was very steep. Exposure of *Oemida* larvae, boring near the centre of similar logs, to comparable temperatures in an electric oven, showed that they could survive at higher temperatures, sustained for longer periods, than those measured in field conditions. As the highest temperatures measured in the field occurred only near the surface of the seasoned log, it is considered unlikely that *Oemida* larvae, boring in the heartwood of both fresh and seasoned Cypress logs, could be killed in timber exposed to the sun in plantations.

753. SCHMIEGE, D. C. **Pine root collar weevil [*Hylobius radicis*].** *For. Pest Leafl. U.S. For. Serv.* No. 39, 1959. pp. 4. 2 refs.

754. KALSHOVEN, L. G. E. **Studies on the biology of Indonesian Scolytoidea. 4. Data on the habits of Scolytidae. First part.** *Repr.* from *Tijdschrift voor Entomologie, Amsterdam* 101 (3/4), 1958 (157–80 + 7 plates). [E.] P.R.

Studies based on observations made by the author and others between 1918 and 1938 on the occurrence of scolytid ambrosia beetles, bark-borers and fruit-borers in Java, their identification and that of the host plants.

755. CHARARAS, C. L'attractivité exercée par les conifères à l'égard de Scolytides et le rôle des substances terpéniques extraites des oléorésines. [**The attractiveness of conifers to Scolytidae and the rôle of the terpenes extracted from the oleoresins.**] *Rev. Path. vég.* 38 (2), 1959 (113–29). 11 refs. [F.g.] I.M.I.

[Cf. *F.A.* 20 No. 3492.] Investigations were made into the specificity in choice of host and part of the

host attacked, with particular reference to the role of oleoresins. The most satisfactory test apparatus in the laboratory proved to be a gauze cage, 80 × 80 × 60 cm., in which infested branches were placed. Above the branches were suspended simple traps consisting of a glass funnel placed over a tube 8 cm. in diam. and containing the product to be tested. Five species were used in the tests: (1) *Ips typographus*, (2) *Pityokteines curvidens*, (3) *Pityogenes chalcographus*, (4) *Cryphalus piceae*, and (5) *Dryocoetes autographus*, with the following substances: α-pinene, β-pinene and limonene + α-pinene, at concentrations varying between 0·05 and 2%. Optimum attraction was exerted within a very narrow range, viz between 0·01 and 0·03%. Species (1) to (4) were still attracted by concentrations of 0·5% and even up to 2%, which were definitely repellent to (5). The last appears, therefore, to be a secondary species attacking only trees in which the characteristic volatile substances have been largely dissipated through evaporation. Field experiments with traps demonstrated a definite attraction by solutions of α-pinene, β-pinene, terpineol and oil of turpentine at a concentration of 0·5%. They had a greater attraction for (1) and (3) than for (5) or for *D. hectographus*, *Hylurgops palliatus*, or *H. glabratus*. Attempts to induce infestations failed both in the laboratory and in the field. A repellent effect was exercised by camphene, borneol, *n*-hendecane, cedar oil, heptane, methanol and butanol. The author suggests that the process of attack runs as follows: (1) a phase of weakness in the tree, characterized by a fall in osmotic pressure and a lowering of the concentration of the characteristic substances; (2) a phase of attack by Scolytidae; and (3) reaction of the host plant by characteristic resin flow. Quantity and % of the attractant substances vary from tree to tree and even in the course of the life of the same tree.

756. CHARARAS, C. Précisions sur l'efficacité des arbres-pièges en fonction des particularités biologiques des scolytides. **[The efficiency of trap trees in relation to the biological peculiarities of the Scolytidae.]** *Rev. for. franç.* 11 (8/9), 1959 (577–84). 8 refs. [F.]

A study of the use of trap trees (standing, girdled trees) for the control of scolytids, leads to the following conclusions: (1) Scolytids are particularly attracted to unhealthy trees provided that their sap is still circulating and their bark moist. (2) Resin exudations caused by bark wounding increase attractiveness for oviposition. (3) Dry trees never attract scolytids. (4) Aspect and illumination are important factors, the attractiveness of a tree being increased by the warming effect of the sun. (5) Standing trees are in general more attacked than fallen ones. The importance of constant supervision and speedy destruction of trap trees is emphasized, but with proper safeguards it is estimated that 75% of the beetles can be destroyed by this method.

757. CHARARAS, C. Recherches sur le déséquilibre physiologique des branches de conifères attaquées par les coléoptères Scolytidae. **[Studies on physiological disequilibrium in branches of conifers attacked by Scolytidae.]** *C.R. Acad. Sci., Paris* 248 (25), 1959 (3612–4). 1 ref. [F.] O.R.S.

[Cf. *F.A.* 20 No. 4913.] Experiments with *Cryphalus piceae* on a branch of *Abies alba* showed that osmotic pressure was normal in needles, twigs and in the main branch nearer the trunk than the point of attack, but abnormally high beyond it. Artificial wounding gave similar results.

758. SOLJANIK, I. Uticaj ekspozicije na zdravstveno stanje šuma (na pojavu potkornjaka). **[The influence of aspect on the health of the forests with respect to barkbeetle attack.]** *Šumarstvo* 12 (3/4), 1959 (141–7). 16 refs. [Serb.e.]

The author concludes from personal observations and an examination of literature, mainly Serbo-Croat, that barkbeetle attacks on conifers are more intensive on S., S.E. and S.W. aspects, i.e. on warmer sites, than on cooler sites in the same forest complex. To improve the health of the forests, canopy density should be kept at ⩾ 0·5 to prevent direct sunlight from falling on the ground or stems.

759. PFEFFER, A. Zur Dynamik der an Fichten vorkommenden Borkenkäfer Mitteleuropas. **[The population dynamics of Spruce barkbeetles in Central Europe.]** *Schweiz. Z. Forstw.* 110 (8/9), 1959 (555–60). 12 refs. [G.f.]

Discusses 7 major ecological groupings (zoocoenoses) of the 27 chief Central European species and the conditions—of tree physiology, human influence etc.—leading to population increases in each. It is stated that outbreaks of *Ips typographus* occur only in stands of the *Abieto-Fagetum* or *Fageto-Abietum*, while *Polygraphus polygraphus* outbreaks are more frequent in artificial stands of the *Abieto-Piceetosum* type.

760. NOSEK, J. Beitrag zur Biozönologie der Borkenkäfer in Auwäldern des slowakischen Donaugebietes. **[On the biocoenology of barkbeetles in the forests of the Danube flood-plain in Slovakia.]** *Anz. Schädlingsk.* 32 (8), 1959 (118–20). 17 refs. [G.]

Presents the results of observations made over 1952–57 on associated insect species, and the life cycles and hosts of the barkbeetles. Tree species suffering most damage are Elm, Ash, Poplar and Oak. Control measures are recommended.

761. STEVENS, R. E. **Ethylene dibromide sprays for controlling bark beetles in California.** *For. Res. Note Calif. For. Range Exp. Sta.* No. 147, 1959. pp. 6. 2 refs.

$C_2H_4Br_2$ sprays are now widely used in California for barkbeetle control. Two different formulations are recommended, an oil spray and a water emulsion spray. New information gained by experience in both methods is presented. [Cf. *F.A.* 18 No. 4342.]

762. INOU(Y)E, M., and YAMAGUCHI, H. **[Control of bark beetles by the application of zinc fluosilicate.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (1–34 + 2 plates). 8 refs. [Jap.e.e.]

Report on experiments made to test the efficacy of trap trees injected with $ZnSiF_6$ for the control of

barkbeetles [cf. *F.A.* 14 No. 509]. Methods of application are described in detail. Good results were obtained against *Ips typographus* attacking *Picea jezoensis*, and *Polygraphus proximus* attacking *Abies sachalinensis*. It appears that injections can be made successfully from May to Oct. inclusive. Physiological factors in the tree appear to influence success of treatment.

763. HERDY, H. **A method of determining the sex of adult bark beetles of the genus *Conophthorus*.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (3), 1959 (1–2).

It has been found that the external characteristics of the 7th and 8th abdominal tergites can be readily used to distinguish the sexes.

764. WILSON, C. L. **The Columbian timber beetle and associated fungi in White Oak.** *For. Sci.* 5 (2), 1959 (114–27). 17 refs.

Describes the nature of the damage (the degrade caused by 'flags' or stains extending from the galleries, causing considerable economic loss of wood for veneer, cooperage and lumber), the anatomy of *Corthylus columbianus*, and the fungi, *Ceratocystis piceae* and *Pichia* sp. consistently associated with *C. columbianus* in its galleries. A number of organisms probably contribute to the staining, the nature of which is described. *C. piceae* is abundant in the area near the galleries and is probably primarily concerned with the staining. *Ascocybe grovesii* was isolated from old galleries and stains but not from adjacent unstained wood, and was not found in association with *C. columbianus* in current galleries.

765. HAWKSWORTH, F. G., and HINDS, T. E. **Progress report on the rate of deterioration of beetle-killed Engelmann Spruce in Colorado.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 36, 1959. pp. 6. 5 refs.

Results of the study suggest that the original gross cubic-foot volume of standing dead trees will be reduced by 34% after 15 years from the time of peak beetle activity. The loss is equally divided between windthrow and decay in standing trees.

766. SHEPHERD, R. F., and WATSON, J. A. **Blue-stain fungi associated with the mountain Pine beetle [*Dendroctonus monticolae*].** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (3), 1959 (2–3).

Blue-stain fungi are usually introduced into a green tree at the time of attack by adults of *Dendroctonus monticolae*. It has been generally thought that these fungi aid the establishment of the beetles by reducing resin flow, though the mode of this reduction is not known. Preliminary studies were made to investigate this relationship by making slides of blue-stained wood associated with barkbeetle galleries to study the distribution of mycelium in the wood cells of Lodgepole Pine. It was found that the resin ducts were not often penetrated by hyphae, but that the epithelial cells that secrete resin collapse after the parenchyma cells have been penetrated and destroyed. It is concluded that the blue-stain fungi probably reduce resin production indirectly through their effect on the parenchyma cells.

767. KNIGHT, F. B. **Measuring trends of Black Hills beetle [*Dendroctonus ponderosae*] infestations.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 37, 1959. pp. 6. 5 refs.

Results of investigation of sampling methods for measuring populations and trends in infestations are as follows: (1) Counting the insects in 50 samples (2 from each of 25 trees) 6 × 6 in. in size gives a reliable estimate of beetle numbers per sq. ft. (2) These samples may be taken from the lower bole, 4–7 ft. above ground. Population fluctuations at that point were similar to those in the upper bole. (3) Populations in the infested trees in the fall and April were unrelated to the infestation trend in the 16 study areas; but populations on the same trees in July, before the beetles emerged, were directly related to it. (4) The distribution of samples can be fitted to the negative binomial. This will be of value in the development of a sequential sampling system. *From author's summary.*

768. ALLEN, D. G., and RUDINSKY, J. A. **Effectiveness of Thiodan, Sevin, and lindane on insects attacking freshly cut Douglas-Fir logs.** *J. econ. Ent.* 52 (3), 1959 (482–4). 3 refs.

Bark of freshly cut Douglas Fir trees in the forest was sprayed to run-off with 25% Thiodan (6,7,8,9,10,10 - hexachloro - 1,5,5*a*,6,9,9*a* - hexahydro - 6,9 - methano - 2,4,3 benzodioxathiepin - 3 - oxide) and 25% lindane wettable powders and 50% Sevin (1-naphthyl N-methyl carbamate) wettable powder, each in dilutions of 1 lb. and 3 lb. active ingredient (a.i.) to 100 gal. water. All applications completely protected against insect attack for at least 8 weeks, except Sevin at 1 lb. a.i. After 19 weeks no successful attacks by *Dendroctonus pseudotsugae* had developed on bark treated with lindane at 3 lb. a.i. or with either Thiodan treatment; other treatments gave less, but still substantial protection. Sapstain and decay were also retarded on treated areas. *From authors' abstract.*

769. RUDINSKY, J. A., and TERRIERE, L. C. **Laboratory studies on the relative contact and residual toxicity of ten test insecticides to *Dendroctonus pseudotsugae* Hopk.** *J. econ. Ent.* 52 (3), 1959 (485–8). 6 refs.

The 4 most effective insecticides were lindane, Thiodan, endrin and isodrin, followed in decreasing order by Sevin, aldrin, heptachlor, dieldrin, DDT, and chlordane. All were more toxic to ♂s than to ♀s except Sevin (more toxic to ♀s).

770. SCHWERDTFEGER, F. Scolytidae (Col.) an *Pinus*-Arten in Mittelamerika. IV. Das Genus *Dendroctonus* Erichson. **[Scolytids on *Pinus* species of Central America. IV. The genus *Dendroctonus*.]** *Z. angew. Ent.* 44 (1), 1959 (43–63). 20 refs. [G.g.e.] O.H.

Describes bionomics, ecology, distribution and forestry importance of *D. adjunctus*, *D. mexicanus*, *D. parallelocollis* and *D. valens*, *D. adjunctus* being the most frequent and most dangerous. [Cf. *F.A.* 19 Nos. 2074, 4558.] *From author's summary.*

771. RÜHM, W.; CHARARAS, C. Description, biologie et histologie de quatre espèces nouvelles de nématodes parasites de *Dryocoetes hectographus* Reit. (Col. Scolytidae). **[Description, biology and histology of four new nematode species parasitic on *D. hectographus*.]** *Entomophaga, Paris* 2 (4), 1957 (253–69). 7 refs. O.H.

Part I: Some new nematode species associated with *D. hectographus* (*W. Rühm* [G.]) [purely nematological]; Part II: The biology and histology of *D. hectographus* and the influence of the nematodes of its digestive tract (*C. Chararas* [F.]) [includes a discussion of the distribution of this secondary pest of *Picea abies* in France, life history etc.]

772. SIERPIŃSKI, Z. Zagadnienie zwalczania kornika zrostozębnego (*Ips duplicatus* Sahlb.). **[The problem of *I. duplicatus* control.]** *Sylwan* 102 (1), 1958 (68–75). 19 refs. [Pol.russ.e.]

Reviews literature, and concludes that felled or standing trap-trees are ineffective. Infested trees should be felled and completely barked immediately.

773. KOLUBAJIV, S. Zpráva o vysledcích prvních pokusů s umělým chovem nejdůležitějších hmyzích přírodních nepřátel lýkožrouta smrkového *Ips typographus* L. v Československu v letech 1953–1954. **[Results of the first experiments in artificially breeding the natural insect enemies of the Spruce borer, *Ips typographus*, in Czechoslovakia during 1953–54.]** *Věd. Práce Výzkum. Ust. Lesa Mysl., Praha* No. 2, 1958 (81–98). 53 refs. [Cz.russ.g.]

In these experiments, which used 8 parasitic and 8 predatory insects [cf. *F.A.* 16 No. 3217], 3 genera of (I) Braconidae—(*a*) *Coeloides bostrychorum*, (*b*) *Dendrosozer middendorfi*, (*c*) *Rhopalophorus clavicornis*, 3 genera of (II) Chalcididae—(*a*) *Pachyceras xylophagorum*, (*b*) *Rhopalicus tutela*, (*c*) *Tomicobia seitneri*, and (III) *Thanasimus formicarius*, were selected for artificial breeding trials, successful results being obtained for (I *c*), (II *a*) and (II *b*) only. Although the biological control of *Ips typographus* thereby obtained proved highly uneconomic [costs of breeding and transport to forest sites are given], recommendations are made whereby all the insects tested may be successfully bred, viz. (1) by improved breeding techniques and modified equipment, based on a detailed study of the bionomy and ecology of all the insects, (2) by the continuous artificial breeding of *I. typographus* (or similar species) as a parasite host, and (3) by improved handling and care of the insects during breeding.

774. INOU(Y)E, M., and NOBUCHI, A. **[Studies on the natural enemies of the bark beetles and borers. II.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (35–42). 11 refs. [Jap.e.*e.*]

Describes the larval stages of the following probable or certain dipterous predators of *Ips typographus*: *Pachygaster minutissima*, *Xylophagus maculatus*, *Medetera* sp., and *Lonchaea* sp. [Cf. *F.A.* 20 No. 808.]

775. YAMAGU[C]HI, H., and KOIZUMI, C. **[Ecological researches on the Ezo eight-spined engraver, *Ips typographus* L. f. *japonicus* Niijima with special reference to its reproduction, behaviour and dispersal. I. The relationship between the density of egg galleries and the progeny population.]** *Extr.* from *Ann. Rep. For. Exp. Sta., Hokkaido 1956*, 1959 (39–47). 8 refs. [Jap.jap.e.*e.*]

Results of investigations of logs from two trees of *Picea jezoensis* felled in May and exposed to beetle attack and examined two months later are shown in graphs.

776. THOMPSON, G. H. ***Orthotomicus* (*Ips*) *erosus* (Woll.) (Col. Scolytidae) in the Forest of Dean.** *Ent. mon. Mag.* 95 (1139), 1959 (95).

Records the finding of this species beneath the bark of the stem of a small recently felled Scots Pine.

777. SIERPIŃSKI, Z. Kwestia zimowania cetyńca mniejszego (*Blastophagus* = *Myelophilus minor* Htg.). **[The problem of the hibernation of *B. minor*.]** *Prace Inst. Bad. Leśn.* No. 199, 1959 (37–48). 26 refs. [Pol.russ.e.]

In order to ascertain where *B. minor* hibernates, observation plots were established in areas of intense infestation in the Włodawa forest reserve, and in the winters of 1956/57 and 1957/58 infested needles of Pine shoots, moss, litter, and humus, felled tree tops and rotted stumps were inspected according to methods described. These observations showed that: (1) Overwintering occurs mainly in needles shed on the ground, 78 (56%) of the 140 hibernating places detected being thus accounted for. Other %s were: in moss, 13; in litter and humus, 28; in the mineral soil down to 5 cm., 1. (2) Hibernation in bark pockets and cracks and in tree butts is uncommon. No evidence of overwintering in living tree crowns was found.

778. GRAHAM, K. **Release by flight exercise of a chemotropic response from photopositive domination in a scolytid beetle.** *Nature, Lond.* 184 (4682: *Suppl.* No. 5), 1959 (283–4). 2 refs.

In laboratory experiments with adult beetles of *Trypodendron lineatum*, designed to determine the factors governing the host-finding process, it was found that phototropic reactions dominated all others. The beetles consistently moved towards sources of light, disregarding odours from attractive wood, to which, however, they reacted in the dark. This consistent domination of behaviour by the photopositive response in the laboratory contrasted with the comparative indifference of the beetles to sunlight and sky light when they are attacking logs in the field. It seemed possible that something in the experiences of the beetles before arriving at their logs abolishes the photic reactions, and that one of these experiences might be flight exercise. Experiments were made with beetles suspended on paper points with adhesive attached to the pronotum. In this position, with substratum removed from the feet, the beetles began wing actions as if in free flight, and they were tested at intervals for photic response. Flight-exercised beetles became either indifferent or photonegative to light, but in some individuals a time lapse of as much as 12 hours after flight was required before the photopositive response was abolished. When placed in contact with attractive bark and wood, the exercised beetles began to bore while in the presence of light, whereas

beetles fresh from hibernation were photopositive and failed to remain on the bark in the presence of light. It is concluded that flight-exercise may play an important part in abolishing the photopositive response of *Trypodendron*, allowing the beetles to react to chemical and contact stimuli.

779. CHAPMAN, J. A., and NEITSCH, R. **Autumn-winter mortality in the ambrosia beetle.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 15 (3), 1959 (3–4).

Adults of *Trypodendron lineatum* overwinter in the forest litter, which they enter by the end of July, and, since spring attack flights usually occur in April or May, the beetles spend 8–9 months of the year in litter in an inactive condition. A study of litter samples indicated that mean mortality during this period is 5–7%.

780. HURPIN, B., and VAGO, C. Les maladies du hanneton commun (*Melolontha melolontha* L.) (Col. Scarabaeidae). [**The diseases of *M. melolontha*.**] *Entomophaga, Paris* 3 (4), 1958 (285–330). 75 refs. [F.f.g.] O.H.

A description of diseases of fungal, bacterial, protozoan, rickettsian or unknown origins, their symptoms, frequency, specificity, temperature or age dependence etc., including potential use in biological control, based on the examination of nearly 4000 specimens, mostly larvae, partly from laboratories, partly from field collections in France, with a review of literature. No virus diseases have been found.

781. NIKLAS, O. F. Krankheiten und Parasiten bei Larven des Maikäfers (*Melolontha* spec.). [**Diseases and parasites of *Melolontha* species.**] *Entomophaga, Paris* 3 (1), 1958 (71–88). 20 refs. [G.g.e.] O.H.

Describes diseases, other than *Rickettsia* [cf. *F.A.* 17 No. 4194], 1 nematode and 2 dipterous parasites found in field and laboratory populations at Lorsch, Hesse, and the periodicity of infections.

782. TACHIBANA, K. [**Influence of electric shock on white grubs. II. Measurement on electric resistance of larvae of *Xylotrupes dichotomus* L.**] *Bull. Tokyo Univ. For.* No. 54, 1958 (169–89). 13 refs. [Jap.e.*e.*]

[Cf. *F.A.* 19 No. 3243.] *X. dichotomus* was found to be more convenient for study than the species previously studied, on account of its relatively large size and ease of rearing in the laboratory. The electrical resistance of the whole body, the cuticle, the blood, and the digestive fluid was measured by the universal bridge, using A.C.

Hymenoptera

See also Nos. 53–4, 724, 1103.

783. KOEHLER, W., and ŚLIWA, E. Doświadczenia nad zastosowaniem pierścieni toksycznyh w walce z osnują gwiaździstą (*Acantholyda nemoralis* Thoms.). [**Experiments on *A. nemoralis* control using the poison ring spray method.**] *Prace Inst. Bad. Leśn.* No. 198, 1959 (3–36). 7 refs. [Pol.russ.e.]

After successful large-scale control of *A. nemoralis* by aerial dusting of stands with arsenates, investigations designed to obtain greater selectivity were made by hand spraying the trees remaining infested after aerial treatment. The importance of ring spraying at imago stage is stressed, so as to avoid damaging other elements in the forest biocoenosis, notably arthropods, and its likely success in view of (i) certain peculiarities in the foot structure of the insect, and (ii) the inability of the egg-laden ♀ to fly. Observations indicated that highly selective and effective results were obtained with rings 50–60 cm. wide, using the Matusz nozzle-type sprayer, despite some damage to Psychidae, *Forficula* sp. and Formicidae. The parasites and most of the predators of *A. nemoralis* remain unaffected. Because of its selectivity, ring spraying is recommended in conjunction with biological control methods (bird population increase, artificial colonization with ants etc.). [Cf. *F.A.* 20 No. 795.]

784. LUITJES, J., and MINDERMAN, G. De spinselbladwesp van de lariks. [***Cephaleia alpina*.**] *Ned. Bosb. Tijdschr.* 31 (9), 1959 (245–53). 7 refs. [Du.e.]

An account of the epidemic on Larch in N.E. Netherlands in 1941–50, giving details of the life history, the extent of the damage, parasites, loss in relation to the normal volume increment, and the financial loss.

785. STRUBLE, G. R. **Egg sampling reveals trend in White-Fir sawfly abundance.** *J. For.* 57 (7), 1959 (510–1). 1 ref.

The technique of egg sampling used in the course of studies on *Neodiprion abietis* [cf. *F.A.* 19 No. 3249] was to take 2 twigs (ca. 6 in. long) from each of 100 randomly selected trees in any given area, before the eggs hatch. When the egg population on 200 twigs is > 20 clutches, an undesirable amount of larval damage can be expected and control may be necessary.

786. GHENT, A. W. **Row-type oviposition in *Neodiprion* sawflies as exemplified by the European Pine sawfly, *N. sertifer* (Geoff.).** *Repr.* from *Canad. J. Zool.* 37, 1959 (267–81). 11 refs.

[Cf. *F.A.* 17 No. 91.] The striking regularity in the spacing of egg pockets along Pine needles, in the row-type oviposition described, appears to be common to all the *Neodiprion* spp. Studies were recently made of *N. sertifer* in S. Ontario, and observations made in reforestation areas and private plantations of *Pinus sylvestris* revealed that the regularity arises from a stereotyped pattern of leg movements associated with the cutting of the egg pockets. The effective forward movement of the 3 pairs of legs is the same, but the total forward movement of the metathoracic legs is greater than that of the others by an amount equal to the length of an egg pocket, and, as the grip points of the legs are on the opposite needle edge to that receiving eggs, the spacing varies inversely with needle width. Observations on copulation, antennal movement, and the behaviour of related species are included.

787. FLOCK, R. A. **Biological notes on a new chalcid-fly [*Flockiella eucalypti*] from seed-like galls in California.** *Pan-Pacific Entomologist, San Francisco* 33 (3), 1959 (153–5). 5 refs. I.I.E.

The insect, reared from *Eucalyptus tereticornis*, is the first phytophagous Eucalypt insect recorded in California.

788. ASKEW, R. R. **A note on *Callirhytis glandium* (Giraud) (Hym., Cynipidae.).** *Ent. mon. Mag.* 95 (1139), 1959 (79).

Acorns of *Quercus cerris* collected from trees and from the ground in Wytham Woods, Berkshire, were found to be heavily infested by this species. There was a remarkable lack of parasites. Acorns of an adjacent *Q. robur* were apparently free from attack.

Diptera

789. GIESE, R. L., and BENJAMIN, D. M. **The biology and ecology of the Balsam gall midge [*Cecidomyia balsamicola*] in Wisconsin.** *For. Sci.* 5 (2), 1959 (193–208). 32 refs.

Discusses taxonomy, distribution and (with illustrations) life stages. Types of galls are described, and gall distribution on Balsam Fir is analysed. Stand conditions associated with epidemics include: soils of pH $> 5{\cdot}0$; and trees (*a*) of poor vigour, (*b*) open-grown, (*c*) $\leqslant$ 25 ft. high, (*d*) of low height for their age and diameter. Biological control of the larvae is exerted by two ectoparasites, *Tetrastichus whitmani* and *T. marcovitchi*, and indirectly by a needle rust, *Milesia marginalis*. A survey procedure (including damage levels for current foliage, and recommendations for marketing) is described, and chemical control, which has not yet been brought to practical levels [cf. *F.A.* 20 No. 760], is discussed.

790. SCHREAD, J. C. **Pod gall [*Dasyneura gleditschiae*] of Honey Locust.** *Circ. Conn. Agric. Exp. Sta.* No. 206, 1959. pp. 4. 4 refs.

Includes some recent research on life history and control. In one test, lindane 20% (1 pint/100 gal. water) gave best control of 1st-brood gall makers. In another, April spraying with DDT 3% emulsion gave good control of the first generation, but none of the second.

459. Other Animals

791. MARTIN, G. C. **Root-knot nematodes (*Meloidogyne* spp.) in the Federation of Rhodesia and Nyasaland.** *Nematologica, Leiden* 3 (4), 1958 (332–49). 13 refs. [E.g.] O.R.E.

Lists the plants (including several tree species) known to be attacked by *Meloidogyne* spp.

792. MARTIN, G. C. **Plant species attacked by root-knot nematodes (*Meloidogyne* spp.) in the Federation of Rhodesia and Nyasaland. Supplementary List No. 1.** *Nematologica, Leiden* 4 (2), 1959 (122–5). 1 ref. [E.] O.R.E.

The additional species listed include a few trees.

48. Injuries Due to Unknown or Complex Causes

793. BUTIN, H., and REUSS, H. Eine auffallende Erkrankung von Kiefernalthölzern. **[A remarkable disease of mature Pine.]** *Allg. Forstzeitschr.* 14 (38), 1959 (665–8). 8 refs. [G.]

Discusses a disease increasingly found on old Pines in various parts of Germany, on the basis of a study in the Kassel and Hildesheim area. Affected trees generally show browning and shedding of needles, a progressive shortening of annual shoots and their needles, and frequently a blood-red discoloration of the inner bark of the butt, and/or *Armillaria mellea* attack. They die in 2–5 years from the onset of symptoms. An analysis of root systems showed that most of the roots of a severely affected tree were dead. Inoculates made from dead cambial tissue revealed fungal infections in many cases (ca. 50% *A. mellea*) but 23% of the inoculates produced neither fungi nor bacteria, pointing to an abiotic cause of root mortality. No pathogenic organisms have been found in bark, wood or discolored foliage. Measurement of annual rings in Pines that had visible symptoms since 1956, showed that increment had decreased sharply since 1954. Frequency of incidence did not appear to depend on soil type or pH, or position in the stand, but increased with age. In some cases all or nearly all trees $>$ 80 years were affected, but none $<$ 40. The authors incline to the view that the primary causes of the disorder are abiotic, chiefly drought and severe temperature fluctuations. They doubt a connexion with *Sclerophoma pithyophila* [cf. *F.A.* 20 No. 2025] and point to the general similarity with the pole blight of *Pinus monticola*.

5. FOREST MENSURATION. INCREMENT; DEVELOPMENT AND STRUCTURE OF STANDS. SURVEYING AND MAPPING

See also Nos. 4–5.

794. SOEST, J. VAN, *et al.* **Recommendations on the standardization of symbols in forest mensuration [by a working group of Section 25 of IUFRO].** International Union of Forest Research Organizations, London. 1959. pp. 32. [E.F.G.]

A limited number on sale to non-members at 2*s.* from the President, I.U.F.R.O. c/o Forestry Commission, 25 Savile Row, London, W.1.

795. SCHÖPFER, W. Bericht über die Tätigkeit des Arbeitskreises für forstliche Biometrie. **[Report on the activities of the [W. German] working group for forest biometrics.]** *Allg. Forstzeitschr.* 14 (36), 1959 (641–8). 13 refs. [G.]

Briefly reviews recent papers, mostly by Prodan and his pupils, in the fields of survey techniques, mensuration, yield studies etc., including unpublished papers dealing with the relation of increment development to diameter structure in selection forests (*J. Weber*), bark and diameter relations in Pine (*V. Christmann*), volume and value relationships (*H. D. Brabänder*; *E. Westernacher*), stem analyses in a mixed stand of the High Black Forest (*E. Zimmermann*) etc.

51. Systems and Units of Measurement

796. DAWKINS, H. C. **A silve for use in Uganda.** *Tech. Note For. Dep. Uganda* No. 74 (59), 1959. pp. 2.

Proposes a local 'silve' related to cu. ft. instead of cu.m., to be calculated from the formula

$$V_s = \frac{D^2H}{100} \times 0{\cdot}2,$$

where V_s = vol. in silves, of a tree D in. in d.b.h.o.b. and H ft. in total height.

52. Measurements of Stem Dimensions and Volume of Trees, Stands, Forests and Timber

521. Diameter (Girth) and Sectional Area

797. MAYER, R. Der Baummesswinkel—ein neues forstliches Messgerät. **[The calipering angle, a new forestry mensuration tool.]** *Allg. Forstzeitschr.* 14 (29), 1959 (530, 532). [G.]

Describes a calipering 'fork consisting of two hinged arms, one ca. 10 cm. wide, which can be fixed rigidly at different angles according to the accuracy required and the diameter to be measured. The wider arm accommodates, as an exchangeable paper strip, a combination scale and tally sheet [illustrated] in terms of diameter, b.a. or (with a suitable tariff) volume, in accordance with the angle chosen. It is wide enough to allow the operator to mark thereon, as on any other tally sheet, the values read off on the scale for each individual tree. This saves the services of an assistant and avoids errors through mishearing etc. In comparative tests the instrument proved equal in accuracy to other calipers.

798. HRAZDÍRA, A. Čtyřcentimetrový interval tloušťkových stupňů. **[A 4-cm. interval for d.b.h. gradations.]** *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 5 (6), 1959 (617–46). 6 refs. [Cz.cz.russ.g.]

Discusses the use of (*a*) 1-, (*b*) 2- and (*c*) 4-cm. intervals in calipering, and compares the results of calculating volume with the Grundner-Schwappach tables, using these three intervals. With Spruce (215 trees, d.b.h. 10–49 cm.), (*a*) showed a total volume of 97·66, (*b*) 98·63 and (*c*) 98·79 cu.m. With Pine (159 trees, d.b.h. 14–39 cm.), (*a*) showed 97·602, (*b*) 96·594 and (*c*) 96·205 cu.m. Further volume data are tabulated for actual measurements using these class intervals on Spruce, Silver Fir, Beech, Oak, Pine, Birch and Hornbeam, and are analysed statistically. Time studies showed that (*c*) was the quickest method for d.b.h. measurement and also for measuring height by diameter classes; calculation of volume by using data from (*c*) took less than half as long as with (*b*). The advantages of (*c*) are discussed and its use is advocated.

799. KENNEL, R. Die Genauigkeit von Kluppung und Umfangmessung nach einem Vergleichsversuch. **[The accuracy of calipering versus girth measurement by tapes, as shown by a comparative test.]** *Forstwiss. Cbl.* 78 (7/8), 1959 (243–51). 7 refs. [G.g.]

On 222 Spruce ca. 50 years old, calipering twice at right angles (*a*) was done with newly calibrated calipers by two different people, each twice (4 measurements/tree), and girth measuring by tape (*b*) was done by three different people, each twice (6 measurements/tree). The b.a. obtained from (*b*) was 2·14% greater than that from (*a*), part of this difference being attributable to the fact that in (*a*) the calipers were pressed fairly hard into the bark. The mean error for 100 trees, as calculated from the deviations from the arithmetic mean, was for (*a*) $\pm$ 0·45% and for (*b*) $\pm$ 0·54% of the b.a. The mean error in measurement by the same person (222 stems) in calipering only one diameter was $\pm$ 0·53% and in (*a*) $\pm$ 0·38% of the diameter; in (*b*) it was $\pm$ 0·19% of the girth. Subjective factors in measuring are important in both (*a*) and (*b*), and can lead to considerable systematic errors in calculating b.a. increment. The accuracy possible in determining b.a. and b.a. increment is greater with (*b*) than with (*a*), if possible errors due to subjectivity in measuring are avoided.

800. HIRATA, T. **[Precisions of variable plot methods (WZP).]** *Bull. Tokyo Univ. For.* No. 54, 1958 (1–17). 15 refs. [Jap.e.]

Compares in detail the precision of results obtained by Bitterlich himself in his original *Winkelzahlprobe*, by Strand in his 'variable rectangular plot' method (with relascope), and random sampling, for determining mean height, mean diameter, and number of stems/ha. [Cf. *F.A.* 18 Nos. 4383–4.]

801. BITTERLICH, W. Relaskoptechnik. Rationelle Waldmessung durch Spiegelrelaskop. **[The technique of the relascope. Efficient forest mensuration work with the mirror relascope [corrections and additions].]** *Cbl. ges. Forstw.* 76 (2), 1959 (116). [G.] [See *F.A.* 20 No. 4970.]

522. Height, Length

See also No. 800.

802. WARREN, W. G. **Tests of some instruments for measuring tree height.** *N.Z. For. Res. Note* No. 12, 1958. pp. 18.

Tests of the Abney level, Haga altimeter, and Blume-Leiss altimeter carried out in 1957 by the Forest Research Institute, New Zealand Forest Service, are described and the results discussed. The factors considered were the accuracy, precision and field times required for each instrument. The tests indicate that for both accuracy and precision most differences are non-instrumental; as absolute tests of the instruments they must be regarded as inconclusive. There is a suggestion that the Abney is the most consistent instrument, but the use of either altimeter results in an appreciable saving in time with little, if any, reduction in accuracy or precision. *From author's summary.*

803. HUNT, E. V., JR. **A time and accuracy test of some hypsometers.** *J. For.* 57 (9), 1959 (641–3). 4 refs.

The Haga altimeter (1), an engineer's hypsometer (2), the Spiegelrelaskop (3), and the Abney hand level (4) were tested for speed and accuracy of tree height measurement by two relatively unskilled

people in a second-growth stand of Shortleaf and Loblolly Pine, ca. 60 years old. Each tree was measured 4 times with each hypsometer, both operators using each instrument twice. Instruments (1) and (2) were respectively ca. 9 and 10 sec./tree faster than (4), which took 24·6 sec./tree; (3) took 52·4 sec./tree. These differences are significant at the 99% level. Maximum expected error per tree was < 4 ft. in most sets of 100 measurements, with a confidence level of 95%. Cumulative average error per tree was never > 0·76 ft. in any set of 100 measurements. The operators found (1) the easiest to use, with (2) the next, and (3) the most difficult.

523. Bark

804. DECEI, I., and ARMĂŞESCU, S. Proporţia şi volumul cojii la salcîm. **[Percentage and volume of bark in *Robinia pseudoacacia*.]** *Rev. Pădurilor* 74 (7), 1959 (397–400). 8 refs. [Rum.russ.g.f.e.]

Measurements were made on 650 trees from a number of Rumanian stands, and % and volume of bark determined as a function of diameter.

524. Determination of the Volume of Trees and Stands

524.1. Principles of Volume Determination. Form (Taper)

See also No. 796.

805 HAMPF, F. E. and BICKFORD, C. A. **A method of estimating cubic volume in felled trees.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 117, 1959. pp. 11 + 2 circular slide rules.

Assumes that the bole from 1 to 9·15 ft. above ground level, from there to crown base, and thence to the top, is the frustum of a neiloid, a paraboloid, and a cone respectively, and presents tables and two circular slide rules for finding the volume of logs from diameters at 1, 5·075 and 9·15 ft. above ground level, at the top of sections, the top diameter, and section lengths. The method is considered midway between planimetering and the use of d.b.h. volume tables in accuracy and laboriousness.

524.3. Volume of Tree Groups and Stands

806. PATRONE, G. Tavola cormometrica dell' abete rosso di Vezza d'Oglio cresciuto in fustaia coetanea. **[A volume table for even-aged *Picea abies* of Vezza d'Oglio (Brescia).]** *Ital. for. mont.* 14 (3), 1959 (120–1). [It.it.f.]

807. MCGEE, C. E., and BENNETT, F. A. **Cubic foot volume tables for Slash Pine plantations of the middle coastal plain of Georgia and the Carolina Sandhills.** *Res. Note Stheast. For. Exp. Sta.* No. 129, 1959. pp. 2.

These give volumes u.b. and o.b. for top diameters of 4·3, and 2 in. o.b., d.b.h. 5–12 in. by 1-in. classes, and heights 20–75 ft.

808. PALLEY, M. N. **Board foot volume tables for young growth coastal Redwood [*Sequoia sempervirens*].** *Calif. For. & For. Prod. Calif. For. Prod. Lab.* No. 11, 1959. pp. 2 + 4 tbls.

809. ESSED, F. E. **A quick, simple, and at the same time accurate method for estimating the total volume and the increment per cent of even-aged stands.** *Proc. 4th World For. Congr., Dehra Dun 1954* Vol. 2, 1957 [1959], (251–5). [E.]

Describes a method of determining the number of trees in a stand from measurements of the distance of the 2nd nearest tree to trees spaced out at 20 × 20 m. intervals over a sample area; the diameters of each of the pairs of trees are recorded, and from these the tree of mean diameter is determined. Stand volume is estimated from these data (taking mean-tree volume to be the volume of the tree of mean diameter). Increment % is determined by ring counts on trees of mean diameter.

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also Nos. 800–1, 815.

810. DISSESCU, R. Cercetări asupra procedeelor de inventariere în arboretele pluriene. **[Methods of enumeration in uneven-aged stands.]** *An. Inst. Cerc. Silv., Bucureşti (Ser. I)* 19, 1958 (101–31). 41 refs. [Rum.russ.g.]

Experiments were made with various types and intensities of sampling, and it is concluded that partial enumerations of uneven-aged stands can be satisfactory, provided that the stands are of a relatively uniform structure. The permissible error can be reduced from 10 to 5%. The highest efficiency can be obtained only by a combination of two or more sampling techniques, e.g. line or plot sampling with angle-gauge (Relascope) sampling. Minimum plot size is 500 sq. m.

811. ANUTSCHIN [ANUČIN], N. P. Eine neue methode der Forsttaxation. **[A new survey method.]** *Forst u. Jagd* 9 (1), 1959 (36–9). [G.]

Describes a simple, easily made tool, essentially a stick whose handle is an inclined cross-piece. By holding the stick vertically close to the eye and sighting down the slope of the cross-piece, the observer counts all trees transected by his line of vision before it reaches the ground, in a circular sweep. A table gives the angles necessary to delimit plots with radii of 5 or 7 m. for observers whose eyes are 145 to 175 cm. from the ground, and a nomogram relates stem numbers per sweep and mean diameters to b.a./ha., stand density etc.

525. Volume by Assortments. Merchantable Volume

See also No. 635.

812. CHARDIN, A., LEPITRE, C., and LE RAY, J. Dimensions des grumes et choix d'un équipement. **[Log dimensions and the selection of equipment.]** *Bois For. Trop.* No. 65, 1959 (43–61). [F.e.span.]

Introduces a simple statistical method of study, applicable to large lots of logs and capable of giving a time picture of the production of a logging site or region in terms of frequency of occurrence of different dimensions in the loads to be handled. This involves plotting frequency curves to show the distribution of logs in % of their total number

or total volume. Individual logs are classified according to their diameter, length, or volume, yielding Gaussian curves that are easy to read, but of little use. These are, however, readily transformed into 'accrued frequencies', which indicate the proportion of logs exceeding, or falling short of, a given dimension. The use of this method is illustrated to determine e.g. selection of a fork-lift truck for handling on cold decks or mill yards, of a skidding tractor, or of saw-mill equipment, and the advantages and drawbacks of fixing a cutting rule to eliminate logs of excessive weight. *From authors' summary.*

813. WARREN, W. G. **The distribution of stand merchantable volume by log-diameter classes.** *N.Z. For. Res. Note* No. 15, 1959. pp. 13 + 6 charts, 1 map. 4 refs.

Describes in detail a method of preparing alignment charts, giving the distribution of merchantable volume by log-diameter class for exotic coniferous stands (*Pinus radiata, P. nigra, P. ponderosa, Pseudotsuga taxifolia*) of known diameters [cf. *F.A.* 17 No. 691; 18 Nos. 738, 774]. Charts, with illustrations of their use in New Zealand, are given.

814. MCGEE, C. E. **Weight of merchantable wood with bark from planted Slash Pine in the Carolina Sandhills.** *Res. Note Stheast. For. Exp. Sta.* No. 128, 1959. pp. 2.

Presents tables of fresh weight in lb. for top diameters 4, 3 and 2 in. o.b., d.b.h. 5–12 in. (by 1-in. classes), and heights 20–75 ft., based on a sample of 250 trees aged 9–25 years, cut during June to Sept. 1957.

815. GILBERT, A. M. **Sampling the quality of hardwood trees.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 114, 1959. pp. 18. 8 refs.

A method is proposed for estimating the total value of a stand or forest. In field studies, the grades of 250 Sugar Maple (*Acer saccharum*) trees ⩾ 11 in. d.b.h. were tallied by 16-ft. sections, assigning the grade of the best 12 or 14 ft. to the entire section [cf. *F.A.* 18 No. 3482], using modified Forest Service standard grades. A tree quality index was constructed from the section quality index, and analysis of variance showed a significant advantage in stratifying the weighted quality index by d.b.h. classes. A procedure for calculating size of samples is explained and its limitations discussed. Further study is needed. Tables for computing conversion values are given in an appendix.

816. BULGRIN, E. H., and WALTERS, R. S. **Butt-log tree grading works in Ohio.** *Sta. Note Cent. St. For. Exp. Sta.* No. 128, 1959. pp. 2. 2 refs.

The system of grading and evaluating *Quercus velutina* from the best 10-ft. section of the 16-ft. butt-log, developed in Illinois [see *F.A.* 18 No. 4415] was tested on the same species in Ohio and found satisfactory. Using this system and scaled volumes, the estimated value of 44 trees differed from 'actual' total value by only 0·6%.

817. RICHARD, G. Olărirea capătului gros al trunchiurilor şi pierderile cantitative di lemn la secţionare. **[Wood losses caused by 'nosing' the butt ends of logs and by careless cross-cutting.]** *Rev. Pădurilor* 74 (2), 1959 (95–7). [Rum.russ.g.f.e.]

Gives graphs and tables showing wood losses due to these causes in logs of different dimensions and makes some recommendations for reducing them to a minimum.

527. Solid Volume of Stacked Products (including Converting Factors)

818. PREBBLE, J. S. **Photographic measurement of wood piles.** *Pulp Paper Mag. Can.* 60 (8), 1959 (78–9).

The following procedure has been developed for simplifying and speeding up the measurement of the amount of pulpwood in cords [cf. *F.A.* 20 No. 2158]. The face of the stack is photographed, and the photograph projected on to a 30 × 30-in. screen having a regular 900-dot grid. Counts of the dots that fall on the spaces and bark (which is lighter than the wood on the screen) vs. those on the solid wood give the proportion of solid wood in the stack.

819. MAKKONEN, O. Mittauskokeita pinotiheyskiilalla ja pinotiheysmittarilla m/Snellman. **[Measurements of stack density with the [Bitterlich] wedge and by the Snellman method.]** *Pap. ja Puu* 41 (6), 1959 (317–24). 5 refs. [Fi.e.e.] P.R.

Comparison of actual stack-density values and values obtained by the angle-count method [cf. *F.A.* 19 No. 3285] and by a Finnish method, measuring the relative amounts of timber and air space falling along a given line along the side of the stack, shows that neither method is satisfactory for individual stacks and small amounts of timber. When fairly large amounts of timber are concerned, the angle-count method probably gives fairly correct values. The edge effect (based on the fact that the edges of the stack are, at least in theory, slightly less dense than the interior) is of no practical importance. *From author's summary.*

820. DECEI, I., and ARMAŞESCU, S. Cercetări asupra factorilor de cubaj şi de aşezare la lemnul de foc fasonat în steri. **[Conversion factors for fuel-wood stacked in steres.]** *Rev. Pădurilor* 74 (2), 1959 (87–90). 11 refs. [Rum.russ.g.f.e.]

Gives factors for the conversion of stacked to solid cubic measure for billets of different sizes, shapes etc., based on Rumanian data.

53. Special Measurements of Treesand Stands (Crown Dimensions, Stand Density etc.)

See also Nos. 486, 800, 809, 843, 845, 851.

821. BREWER, L. C., *et al.* **A device for measuring crown diameters of open-grown trees.** *J. For.* 57 (8), 1959 (577). 1 ref.

Describes a technique of using a graduated cross-arm at the end of a 3-ft. stick from a sighting point which is at a known distance (50 ft.) from the tree. Calculation of crown diameter is based on the properties of similar triangles. Cross-arm graduations are tabulated for crown radii of 3, 4, 5 . . . 20 ft.

822. EULE, H.-W. Verfahren zur Baumkronenmessung und Beziehungen zwischen Kronengrösse, Stammstärke und Zuwachs bei Rotbuche, dargestellt an einer nordwestdeutschen Durchforstungsversuchsreihe. **[A method for measuring tree crowns, and the relations between crown projection, stem diameter and increment in Beech on N.W. German thinning plots.]** *Allg. Forst- u. Jagdztg.* 130 (7), 1959 (185–201). 92 refs. [G.g.e.]

Describes investigations on three half-ha. plots in 135-year stands heavily thinned at 80 to 100 years, of which (*a*) was later again thinned heavily, (*b*) moderately and (*c*) not further thinned, their stem numbers being respectively 72, 102, and 138, and b.a./ha. 16·8, 21·14, and 23·16 sq. m. Crowns were mapped from aerial photos with a 'Zeiss' stereotope, with some correction from the ground, and their projection areas computed as circles from the mean of 3 diameters. Crown density was 0·78 of available space in (*a*), 0·88 in (*c*). Basal area and b.a. increment increased with crown area but less than proportionately. Increment produced by crowns of a given area and also the crown-diam./stem-diam. ratio were greater on (*a*) and (*b*) than on (*c*). Within each plot, b.a. increment % was largely independent of crown area. Results suggest that medium crowns would make the best use of a site.

823. YAMAHATA, K., and MASUOKA, M. **Studies on the management of the coppice forest (VI). The correlation between crown-diameter and diameter breast height and the spacing value of isolated Kunugi trees (*Quercus acutissima* Carr).** *Memoirs of the Ehime University, Matsuyama (Sect. VI, Agriculture)* 4 (2), 1959 (96–102). 9 refs. [E.e.jap.]

Measurements were made of height, d.b.h. (*D*), crown diameter (*S*) and age of 130 sample trees, standing alone, which had not been pruned, thinned or given any other form of treatment. Values of log. *S* and log. *D* were plotted against one another and the equations log. $S = 0{\cdot}592 + 0{\cdot}58$ (log. $D-1$) and (using Toda's coefficient of log. *D* [see *F.A.* 15 No. 3880]) log. $S = 0{\cdot}584 + 0{\cdot}51$ (log. $D-1$) were derived. The differences between the two equations proved to be significant at the level of significance below 5%, and their confidence belt overlapped at the 95% level of both equations. It seems possible that a universal coefficient, value ca. 0·500–0·600, may be determined for all tree species. The spacing value (representing the degree of crown slenderness) of Kunugi was ca. 47–72 (mean 59) for 0·58 log. *D* and ca. 45–69 (mean 58) for 0·51 log. *D*. The inclination of the regression line *S* to *D* needs further investigation.

824. WARRACK, G. C. **Crown dimension, initial diameter and diameter growth in a juvenile stand of Douglas Fir.** *For. Chron.* 35 (2), 1959 (150–3). 5 refs.

This report attempts to evaluate 6 years' diameter growth in terms of crown width, a crown index (crown width × crown length), and d.b.h., after thinning an 18-year-old stand of Douglas Fir. It also assesses the relative contribution of the combined factors, d.b.h. and crown width, in correcting the estimate of the diameter increment, and provides a chart from which inferences may be drawn in respect of the crown width necessary for a desired diameter growth.

825. MAGIN, R. Kronengrösse und Zuwachs in mehrschichtigen Mischbeständen. **[Crown size and increment in multi-storeyed mixed stands.]** *Forst- u. Holzw.* 14 (15), 1959 (309–12). 16 refs. [G.]

It is argued that the crown characteristic that has the closest connexion with stem increment is crown surface area, and particularly the area of that part of the crown that has good light conditions. [Cf. *F.A.* 13 Nos. 156–7.] The difficulties of making accurate and extensive crown measurements in multi-storeyed mixed stands, e.g. Spruce/Silver Fir/Beech are, however, extreme. The results of the author's investigations on 19 sample plots are reviewed; they show that, for such stands, it is impossible to construct accurate increment tables or accurately to predict increment, from crown measurements. The problem is made more difficult by the present incomplete understanding of even the qualitative importance of some of the other factors affecting increment, e.g. genetics, root relationships, weather, soil microbiology etc. [Cf. *F.A.* 19 No. 2157.]

826. RODIONOV, M. S. Ob opredelenii massy listvy zaščitnyh lesopolos. **[Determining foliage weight in shelterbelts.]** *Bot. Ž.* 44 (3), 1959 (333–7). 9 refs. [Russ.]

In continued work [cf. *F.A.* 18 No. 744] correlation coefficients of ⩾ 0·90 and ⩾ 0·93 between diameter at root collar and fresh weight of foliage were found for 2- to 4-year-old *Quercus robur* and *Fraxinus pennsylvanica* in shelterbelts. For older belts, collection of all the leaves from an adequate number of sample trees becomes very laborious, and accordingly Cummings' method [see *F.A.* 3 p. 113] was used on pure *Populus* '*canadensis*' in shelterbelts (5–23 years old) with occasional *Salix viminalis*; 65 Poplar branches (diam. 0·3–12 cm.) and 35 Willow branches (0·3–4·6 cm.) were sampled. Correlation coefficients of foliage weight with branch diameter of 0·89 and 0·86 were found for Poplar and Willow respectively. From this, calculation of the total foliage weight on sample trees, or on all trees on sample plots, by measuring the diameters of all first-order branches, is feasible, both as regards accuracy and the labour required.

827. SATOO, T., and SENDA, M. **[Materials for studies of growth in stands. IV. Amount of leaves and production of wood in a young plantation of *Chamaecyparis obtusa*.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (71–100). 33 refs. [Jap.e.*e.*]

[Cf. *F.A.* 19 Nos. 3296–7.] Studies were made on 28 sample trees (dominant, average and suppressed) from 3 sample plots in a 28-year plantation of *Chamaecyparis obtusa* with closed canopy. Amount of leaves (*a*) and branches (*b*) per tree was related to d.b.h. in such a way that log. (*a*) and log. (*b*) were both linearly related to log. d.b.h. The value of (*a*) per ha. was ca. 30 metric tons green weight and ca. 13 metric tons oven-dry. Branchwood/ha. was estimated to be 16·5 metric tons in green weight, 12 cu.m. in volume, and 0·4 ha. in surface area.

Mean production of stemwood per kg. leaves was 400–600 c.c. or 160–200 g. dry weight. Production of stemwood per unit quantity of foliage increased with increasing quantity of foliage in small, but not so much in large trees, and in general increased with increasing height of tree. The quantity of foliage per unit quantity of branches increased with increasing height and d.b.h., and was high compared with that in species previously investigated. The vertical distribution of leaves and branches in the crown of dominant and average trees was similar, but that in suppressed trees resembled the distribution in the lowest parts of the crown of dominant and average trees.

828. Satoo, T., Negisi, K., and Senda, M. **[Materials for the studies of growth in stands. V. Amount of leaves and growth in plantations of *Zelkova serrata* applied with crown thinning.]** *Bull. Tokyo Univ. For.* No. 55, 1959 (101–23). 29 refs. [Jap.e.*e.*]

Studies were made in a 42-year-old plantation, part of which (*a*) had been thinned at irregular intervals and the rest (*b*) left unthinned. Stem volume, green and oven-dry weight and surface area of leaves, and stem c.a.i., showed close connexion with d.b.h., and the logarithms of these values were linearly proportional to log. d.b.h. Values were higher on (*b*) than on (*a*). Stem volume increment was closely related to amount of leaves per tree, and stemwood increment per unit of leaves was closely connected with size and dominance as represented by d.b.h., height, and quantity of leaves, larger and more dominant trees producing more wood per unit foliage. Stem volume c.a.i. per unit foliage appeared to be greater on (*b*) than on (*a*). Oven-dry leaf weight (per leaf and per unit area of leaves) was roughly proportional to d.b.h. and height of tree.

829. Jovanović, M. Odnos između količine lišća i proizvedene drvne mase kod srebrnaste lipe. **[The relationship between the amount of foliage and wood volume produced in *Tilia tomentosa*.]** *Šumarstvo* 12 (1/2), 1959 (57–64). 5 refs. [Serb.e.]

Eleven trees, 31 to 76 years old, were felled at Fruška Gora in July 1957 in order to study the amount of foliage in relation to the increment of the previous year (since this species begins to shed its leaves in late summer), and data are given, showing both the range of values and the mean, for leaf area, number of leaves and surface area per 1 kg. of leaves, and the number, weight and surface area of leaves necessary to produce (*a*) 1 kg. and (*b*) 1 cu.m. of wood plus bark. The amount of wood (0·000153 cu.m.) produced per 1 sq. m. of assimilating area is similar to the value for *Robinia pseudoacacia*, less than that for hybrid Black Poplar, and more than that for Oak in Jugoslavia.

830. Prodan, M. Umrechnung von Massen in Flächenanteile. **[Conversion [for species mixtures] of volume percentages to area percentages.]** *Forstarchiv* 30 (6), 1959 (110–3). [G.]

Discusses methods of converting volume % into area %, and presents tables for two-species mixtures of Spruce, Beech, Pine and Oak (separately for stands aged > 60 or < 60 years) based on Wiedemann's tables, and describes a method for converting volume into area % for 3-species mixtures, using a system of triangular coordinates.

54. Assessment of Site Quality

See also Nos. 24–5, 233, 835, 837–8, 851, 860.

831. Vimmerstedt, J. P. **Site index curves for Southern Appalachian White Pine plantations.** *Res. Note Stheast. For. Exp. Sta.* No. 131, 1959. pp. 2.

Gives a method for estimating the site index (here the mean total height of dominant and co-dominant trees at 25 years from seed) of a plantation. Height and age determinations on 111 plots of *Pinus strobus* in N. Carolina, N. Georgia and E. Tennessee provided the basic data for the site-index curves, which were constructed from a regression equation in which the logarithm of site index was estimated from the logarithm of height and the reciprocal of age. These curves show the future height of trees whose present height and age are known, and proved a convenient measure of site quality.

832. Halaj, J. Prieskum výškovej vzrastavosti drevín na Slovensku a návrh stupníc výškových bonít. **[Investigation of the height growth of Slovakian tree species, and a scale of height-quality classes.]** *Lesn. Čas.* 5 (3/4), 1959 (173–204). 25 refs. [Slovak. russ.g.]

Using data from 117,550 even-aged pure and mixed stands in Slovakia, mean height-growth curves were drawn for pure Spruce, Silver Fir, Pine, Larch, Beech, Maple, Hornbeam, Oak, Ash and Elm, for ages up to 150 years. From these curves site classes based on height are distinguished for each species. C.a.i. (height) curves are also drawn for the 9 site classes of each species. The height-growth curves of the species in two of the most important mixtures found in Slovakia (viz. Oak/Turkey-Oak/Beech/Hornbeam/Pine/Ash, and Beech/Silver-Fir/Spruce/Pine/Larch/Maple/Ash) are given, and the c.a.i. (height) is shown for each species in the mixtures.

55. Age Determination

See No. 275.

56. Increment. Development and Structure of Stands

See also Nos. 122, 275, 324, 326–8, 336–9, 341, 352 *et seq.*, 382, 460, 481 *et seq.*, 822, 824–5, 827–9.

833. Corona, E. La curva logistica come brachistocrona dello spazio. **[The logistic curve as a brachystochrone of space.]** *Ital. for. mont.* 14 (2), 1959 (60–3). 11 refs. [It.f.]

The author analyses some peculiarities of the logistic curve used to represent the height, basal-area and volume increment of an even-aged forest. The mathematical implications of the curve and the parallel between dendrometry and optics are also discussed.

834. Møller, C. M. Ein Wuchsgesetz. **[A growth law.]** *Forstwiss. Cbl.* 78 (7/8), 1959 (203–11). 11 refs. [G.g.]

Møller's growth law, propounded in 1951 [cf. *F.A.*

13 No. 4073], states that, for the same species and same age, the c.a.i. in total volume per ha. (*Derbholz + Reisholz*) is roughly proportional to the stand height. The law fits the Danish 1933 yield tables for Beech, Oak and Spruce with considerable accuracy. Its accuracy was further tested with ca. 10 tree species, using Danish and German yield tables (particularly Wiedemann-Schober, 1957). The *Derbholz* increment showed a mean deviation of 5% from that obtained according to the law. An analysis is made of the law's bases and the different deviations from it.

835. GOGGANS, J. F., and SCHULTZ, E. F., JR. **Growth of Pine plantations in Alabama's coastal plain.** *Bull. Ala. Agric. Exp. Sta.* No. 313, 1958. pp. 19. 17 refs.

Reports a study of the correlation of soils and other site factors with the height growth of 5- to 16-year Slash, Loblolly and Longleaf Pine. Regression equations for estimating the heigh tof the tallest trees were developed, and for 8- to 16-year Longleaf Pine age alone proved as good a predictor of height as any. In no case were mineral-nutrient element concentrations of the top 6-in. soil layer found to be closely correlated with height growth, either when considered alone or with soil physical and climatic variables held constant. Regression equations developed for estimating the merchantable volume in cords of rough wood per acre are also presented.

836. CHIBA, H., SEGAWA, K., and IGARASHI, Y. **[On the growth of planted [stands of] *Alnus hirsuta* Turczaninow var. *microphylla* (Nakai) Tatewaki in Aomore prefecture, Sannohe district.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 107, 1958 (101–15). 11 refs. [Jap.jap.e.]

Presents enumeration data from 6 stands, aged 8–20 years. Stem analysis indicated that diameter and height c.a.i. culminated at 3–8 years, and volume c.a.i. at 11 years. Within the range of 1000 to 2600 stems/ha., stand increment increased with density. The highest m.a.i. was 13·6 cu.m. on an 11-year-old stand with a standing volume of 177·9 cu.m.

837. BABOS, I. Akácosok termöhelyvizsgálata a Duna-Tisza közi homokhát erdögazdasági táján. **[Site investigations in the *Robinia pseudoacacia* stands growing on the ridge of sand hills between the Danube and Tisza rivers.]** *Erdész. Kutatsá., Budapest* 1958 (1/2), (3–58). 30 refs. [Hu.russ.e.g.]

The investigations were made in 199 pure Robinia stands established in 1922–36 by conversion of the indigenous Oak/Poplar forests. None of the stands can fully utilize the potential productive capacity of the site, but some, especially those in the depressions, are very good. The danger from *Calamagrostis epigeios*, and methods of its control, usually involving the use of mixtures rather than pure Robinia stands, are outlined. Trench ploughing before planting resulted in very good initial height growth, but this fell off later, and the top height at ⩽ 10 years is not a reliable indication of true site quality. Analysis revealed that, in 33% of the stands, the height increment curves fell continuously from 15 to 25 years, involving in some cases a drop of 2–3 quality classes. The forest types in the plantations cover 2–4 site quality classes, and consequently forest types cannot be used for site classification. The pros and cons of conversion from Oak/Poplar to Robinia are discussed for the various site types. Further conversion is not advocated.

838. SZÖNYI, L. Növekedési vizsgálatok akácosokban. **[Growth investigations in stands of *Robinia pseudoacacia*.]** *Erdész. Kutatás., Budapest* 1958 (1/2), (59–75 + 1 tbl.). [Hu.russ.e.g.]

Gives the results of analysis of height, diameter, b.a. and volume increment in plantations between the Danube and the Tisza, as functions of site, and makes proposals on the sequence and timing of fellings. The influence of precipitation on diameter increment is examined, and the importance of the so-called 'precious' Robinias ('*Wertrobinien*') discussed. These specimens have outstanding qualities of height growth, form and volume. It is not known whether they are products of genetically superior seed or of hybridization; the attention of tree breeders is drawn to them.

839. SCHMITZ-LENDERS, B. Reaktion der Pappel auf Grundwasser-Absenkung und neue Erkenntnisse betreffend den Zuwachsgang in Harffer-Pappel-Weitverband-Beständen des Niederrhein-Gebietes. **[The reaction of Poplars to a lowering of the water table, and new light on the course of increment in widely spaced stands of the Harff Poplar [*Populus x regenerata*] in the Lower Rhine region.]** *Allg. Forst- u. Jagdztg.* 130 (7), 1959 (201–4). 2 refs. [G.]

Presents growth curves for d.b.h. and height of 3 stands, now 11–18 years, showing (*a*) a distinct falling off in growth after pumping operations in opencast coalfields near by, and (*b*) before that, faster growth than shown in the author's tables [cf. *F.A.* 20 No. 1630]. Extrapolation of the curves suggests, however, that values for the second half of a 60-year rotation would be smaller.

840. GEORGIEFF [GEORGIEV], J. Die euro-amerikanische Pappel, die leistungsfähigste Holzart in der Volksrepublik Bulgarien. **[*Populus x canadensis*, the tree with the highest yield in Bulgaria.]** *Forst u. Jagd* 9 (2), 1959 (55–7). 6 refs. [G.]

Contains data, from the author's local yield table, on height and diameter growth, and the effect of spacing on diameter, increment and yield.

841. OSSE, L. Resultada de uma cultura de jacaré. **[Results from an artificial stand of Jacaré [*Piptadenia* sp.?].]** *Brasil madeireiro* No. 126, 1958 (26–9). [Port.]

A plantation of Jacaré was established in 1938–39 by the Companhia Siderúrgica Belgo Mineira near Monlevade, partly by direct sowing and partly by planting at spacings from 1 × 1 to 3 × 3 m. In 1953 the stand occupied 62 ha. and had received little silvicultural care. Data are presented, from measurements made in 1953, on its constitution, on insect species found during a 1955–57 survey, and on

production of fuelwood. From 107,891 trees felled at ca. 18 years of age, 5741·5 cu.m. of wood suitable for charcoal was obtained.

561. Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology

See also Nos. 84, 484, 809, 822, 824–5, 827–9, 833.

842. Lynch, D. W. **Diameter growth of young Ponderosa Pine trees in the Inland Empire.** *Res. Note Intermt. For. Range Exp. Sta.* No. 59, 1958. pp. 3. 2 refs.

Presents 3 tables designed to predict future 10-year diameter growth on sites 'II or better' to 'VI or poorer'. They are based on increment-core measurements on ca. 5000 trees already used in preparing volume-growth tables [cf. *F.A.* 17 No. 721].

843. **Performance studies in tropical high forest.** *Extr.* from *Rep. For. Dep. Uganda 1957/58*, 1959 (22–3).

Multivariate analyses by electronic computer were made of girth increments of 5 species ranging from slow to rapid growing in this order—(*a*) *Entandrophragma angolense*, (*b*) *Lovoa brownii*, (*c*) *Celtis mildbraedii*, (*d*) *Albizzia zygia* and (*e*) *Antiaris toxicaria*. Four factors were examined: initial girth, basal-area crowding, crown exposure, and crown size. The conclusions are as follows:—(1) The species vary greatly in sensitivity to the 4 variables, which account for 50% of the behaviour (in girth) of (*c*), 38% of (*b*) and (*e*), but only 25% of (*d*). (2) All girth increments were positively correlated with crown size and exposure, and negatively with b.a. crowding, the highest significances invariably occurring with crown size. There was a general tendency for girth increment to decrease with bole size, except in (*c*) where it slightly increased. (3) In every case b.a. crowding as estimated by relascope tally gave higher negative correlations with girth increment than estimates derived from direct measurements within 30-ft. or 60-ft. radii. (4) In general, crown size was so overwhelmingly the most important factor, that actual measurements will be imperative in future (it was estimated visually for this study).

844. Chappuis, J.-B. Calculs d'accroissement par sondages. [**Increment determination based on increment cores.**] *Schweiz. Z. Forstw.* 110 (6/7), 1959 (422–34). [F.g.]

Describes increment studies in 3 forests in the Jura based on the method of Loetsch and Meyer [cf. *F.A.* 15 No. 564]. The results, based on ca. 1500 cores and covering 20, 25 and 10 years respectively, correspond well with p.a.i. values computed as a difference of periodic inventories in the two mixed selection forests analysed. A discrepancy of nearly 20% (9·6 against 8·1 cu.m./ha.) on an even-aged Spruce stand is thought to be due to incorrect recording of fellings. Results were further analysed for the effect of altitude, climatic factors (the weather of 5-year periods) etc. on total increment, increment of individual species, diameter classes etc. Silver Fir was the fastest grower throughout (with an optimum in the pure Beech forest type) and Spruce the most regular. The method is thought to be capable of supplying valuable information on these lines.

845. Grossmann, H. Untersuchungen über die Anzahl von Bohrspänen bei Zuwachsinventuren und die Beziehungen zwischen Zuwachsleistung und Kronengüte. [**The number of increment cores required in sampling to determine increment, and the relation between increment and crown quality.**] *Forst u. Jagd* 8 (11), 1958 (510–1). [G.]

Briefly reports on pilot surveys in regular and selection forests prior to the general introduction of the method [cf. *F.A.* 18 No. 3202] planned for 1959, discussing stratification, coefficients of variation etc. Correlation between crown volume and increment was fairly close, particularly for Pine.

846. Bell, R. E. **Dendrochronology.** *New Zealand Science Review, Wellington* 16 (1/2), 1958 (12–7). 15 refs. L.S.

Following a short review of Douglass's pioneer work, its applications in the U.S.A. and the problems involved, the author describes his attempts to date Maori material from analyses of specimens of Kauri (*Agathis australis*) and Totara (*Podocarpus totara*), collected from 4 districts in New Zealand. The difficulties encountered are described. No similarities in growth-ring patterns were found, except for the Auckland district, where the author considers tree-ring dating based on separate master charts for the two species, supplemented by White Pine (*P. dacrydioides*), to be possible. Practical considerations, stressing the necessity for skilled selection of basic field specimens, are discussed.

847. Wilhelmi, T. Ein Testversuch über die Abhängigkeit des Dickenwachstums der Bäume von der Globalstrahlung und Lufttemperatur. [**The effect of total radiation and air temperature on the diameter growth of trees.**] *Allg. Forst- u. Jagdztg.* 130 (7), 1959 (204–9). 6 refs. [G.e.]

When daily microdendrometer readings [cf. *F.A.* 18 No. 3198] on 6 trees (Lime, Hornbeam and Birch) were compared with actinometer readings for direct and indirect, visible and invisible radiation, mean values were least for all cloudless and greatest for all wholly overcast days, but correlation between radiation of individual days and increment on these or the following day was small. It was much greater when the radiation received in one week was compared with the increment of the next, but less than the correlation between mean temperatures and that week's increment, suggesting that temperature rather than radiation is the chief regulating factor where, as with these trees growing on a river bank, water is always plentiful. Hourly readings taken on 2 trees on 3 'normal' summer days showed greatest increments between 6 and 10 p.m., and negative values between 6 a.m. and 3 p.m., the latter attributed to loss of turgor in young tissue.

848. Dmitrieva, E. V. Opyt analiza vlijanija klimata na prirost derev'ev različnyh mesto-obitanij na Karel'skom perešejke. [**Analysis of the influence of climate on the increment of trees in different habitats on the Karelian isthmus.**] *Bot. Ž.* 44

(2), 1959 (162–76 + 2 plates + 1 tbl.). 15 refs. [Russ.e.]

Using disks cut at a height of 1·3 m. from 34 dominant sample trees of *Picea abies* and *Pinus sylvestris*, the influence of climate on diameter increment was investigated for the period 1853–1950. The influence of favourable weather, dry weather, heavy precipitation, fluctuating soil moisture during the growing season, winter temperatures, conditions in early spring and at the time of bud formation, and conditions at the end of the growing season were determined. The effect of climate on the increment of trees from dry and wet forest types was also investigated. Absolute increment values were converted to relative values for ease of comparison. It is concluded that to obtain reliable climatic data from growth rings, investigations must be made not only for each climatic region but also separately for each type of habitat.

849. ERMICH, K. Badania nad sezonowym przebiegiem przyrostu grubości pnia u *Pinus silvestris* L. i *Quercus robur* L. **[The seasonal course of diameter growth in *P. sylvestris* and *Q. robur*.]** *Acta Soc. Bot. Polon.* 28 (1), 1959 (15–63). 49 refs. [Pol.pol.e.] O.B.D.

Investigations were made during the 1955 and 1956 growing seasons on increment cores from Pine and Oak in the Niepolomice forest. In Pine, cambial activity began after 10th May and the first xylem elements appeared after 20th May. Late-wood formation began in the second half of July and at the beginning of August. No marked difference was found between trees within and on the margin of the forest. In Oak, cambial activity and diam. growth began at the end of April and beginning of May. Late wood began to develop at the end of June and the beginning of July. In Pine, diam. growth ceased in most cases at the end of September. Again there was no marked difference in trees growing in the middle of the forest and on the forest margin. In Oak, there was no uniformity in the time of cessation of growth, so that this can only be fixed roughly as the second half of September. In Pine, all stages of diam. growth occurred later than in Oak. In Oak, growth began before, and in Pine after, development of the leaves. Growth rate of Pine growing within the stand was greatest in June and July, and on the forest margin in August. Greatest diam. growth in Oak took place in May and June. Beginning of growth was influenced by rainfall and rise of temperature, the latter factor being the more important for Oak. The influence of temperature on the diam. growth of Pine within the stand was noticed in both years. A pronounced influence of rainfall at the stage of early-wood formation was observed in 1955 but not recorded in 1956. In Pine on the forest margin, the formation of early wood was affected by rainfall in both years. In Oak, the influence of rainfall and atmospheric humidity was pronounced almost throughout the 1956 growing season, but no such relationship was observed in 1955. It was not clear whether rainfall and temperature affected the time of cessation of growth in these two species. *From author's summary.*

850. GROSENBAUGH, L. R. **Comments on new growth percent formula.** *J. For.* 57 (7), 1959 (515–6). 1 ref.

Comments on, and points out inconsistencies in, a work already noticed [see *F.A.* 20 No. 5018], and presents tables to clarify the names, algebraic relationships and appropriate bases for valid volume projection by the various growth-rate formulae.

562. Volume Increment

See also Nos. 834, 844–5.

851. HALL, M. J. **The effect of stocking density, site quality and age on the volume of pulpwood produced per acre [with discussion].** *APPITA, Melbourne* 13 (1), 1959 (22–9). 4 refs.

From ring counts and measurements on 3 sample trees felled on each of 50 plots of *Eucalyptus obliqua* and 48 plots of *E. sieberiana*, the full growth pattern of the mean of the three trees felled was found and graphed. Multiple regression analyses were made to separate the effects of the stand density, site quality and age on total and merchantable m.a.i. (volume) in both species. Evidence indicates that pulpwood production increases with stocking density, increases markedly with site quality, and that, with *E. sieberiana* at least, the age of maximum pulpwood production lies broadly between 40 and 50 years (min. length 18 ft., min. diameter 4 in. u.b.). With a higher merchantable limit of 8 in. u.b. in *E. obliqua*, merchantable volume m.a.i. culminates at 60 years, at a stand density index of 460 (equivalent number of trees of 10 in. d.b.h.o.b./acre). In a spacing trial in *Pinus radiata* established in 1950, at 6×6, 7×7, 9×5 and 9×6 ft., it was found that total b.a. increases with site quality and with stocking density for at least the first eight years.

852. VYSKOT, M. Možnost rekonstrukce probírek (probírkových těžeb) na základě inventarizací. **[The possibilities of calculating the amounts felled in thinnings from stand inventory data.]** *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 5 (7), 1959 (705–22 + 1 tbl.). 16 refs. [Cz.cz.russ.g.]

As it is often necessary to know the volume removed in earlier thinnings, when no records are available, two variants of the formula

$$H_{pp} = \Delta N . h_{pp}$$

(where H_{pp} = total vol. felled, ΔN = the difference between the original and final number of trees, and h_{pp} = mean vol. per tree of those felled) were tested for their accuracy in reconstructing such data. The figures used represented three mixed stands in which complete inventories had been made in 1926 and 1957, and for which complete records of thinnings during this period were available. Both variants of the formula gave results that differed widely from the recorded thinnings. A third method, in which these volumes were calculated by ascribing to the stumps the standing volumes of trees now having the same stump diameter, gave quite good agreement with the records.

853. WARRACK, G. C. **Forecast of yield in relation to thinning regimes in Douglas Fir.** *Tech. Publ. B.C. For. Serv.* No. *T.*51, 1959. pp. 56. 17 refs.

The main section deals with an investigation of the possibilities of predicting basal-area and height increment in relation to different thinning regimes in immature Douglas Fir, in which the inadequate British Columbia sample-plot data were supplemented by case histories from Great Britain and the continent of Europe. There are also sections on: method of cubic-volume determination and calculation of two thinning regimes; estimation of gross volume increment; the effect of thinning intensity on basal area; the effect of thinning intensity on diameter classes of thinned trees, and financial considerations.

565. Sample-Plot Technique

854. HUMMEL, F. C., *et al.* **Code of sample plot procedure.** *Bull. For. Comm., Lond.* No. 31, 1959. pp. v + 113.

Sets out in detail the procedure that has been developed by the Forestry Commission's research officers for the systematic measurement of sample plots since such measurements were begun (under the Board of Agriculture) 45 years ago. There are chapters on: selection and general management; lay-out of plot and marking of thinnings; descriptions; measurements and maintenance; computations and records. There are also a number of appendices: list of equipment; tree classification; grades of thinning; use of dendrometer for measuring volume of standing trees; calculation of volume of partially climbed sample trees; Keen's method of estimating linear regression; determination of volume of previous thinnings from stump diameters; summaries of work; worked examples from sample-plot files; formulae and tables; general notes on computation; main differences between the revised code of 1958 and the procedure of 1931; summary of duties of the sample-plot forester; definitions of terms.

855. NEEBE, D. J., and BOYCE, S. G. **A rapid method of establishing permanent sample plots.** *J. For.* 57 (7), 1959 (507). 3 refs.

Describes the use of a plywood disk with its surface divided into 36 ten-degree sectors numbered clockwise, placed at plot centre. The location of a given plant within a plot is then established by measuring its distance from disk circumference and noting the number of the sector in which it lies.

566. Yield Tables and Their Construction

856. MITSCHERLICH, G. Fichtenwachstum und Ertragstafelfrage. Das Fichtenwachstum in Baden-Württemberg im Vergleich zur Ertragstafel von Wiedemann. **[The growth pattern of Spruce and the yield-table question. The growth pattern of Spruce in Baden-Württemberg in relation to Wiedemann's tables.]** *Allg. Forstzeitschr.* 14 (28; 29), 1959 (509–13; 521–4). 23 refs. [G.]

Demonstrates, chiefly by reference to local trial plots, how provenance, injuries, treatment (including establishment) and site factors cause so many and such varied deviations from yield-table growth curves, and hence shifts in site class, that local tables would be no solution. Wiedemann's tables are thought to be, on the whole, a better fit than Zimmerle's for the country as a whole, besides having the added advantage of being used in the rest of Germany and prescribed for tax purposes.

857. AVRAM, C. Tabele de producţie provizorii pentru principalele specii forestiere din lunca Dunării. **[Provisional yield tables for the principal forest tree species growing on the banks of the Danube.]** *Rev. Pădurilor* 74 (3), 1959 (156–9). [Rum.russ.g.f.e.]

Gives tables for pollarded Willows, osiers, hybrid Black Poplars and *Fraxinus pennsylvanica.*

858. MØLLER, C. M., and NIELSEN, C. Bonitetsvise tilvækstoversigter for ask i Danmark ca. 1950. **[Yield tables by site class for Ash in Denmark ca. 1950.]** *Dansk Skovforen. Tidsskr.* 44 (6), 1959 (340–401). 18 refs. [Dan.e.*e.*]

Material for construction of the yield tables came from 142 temporary sample plots measured in 1952–53 or 1958 and from 23 permanent ones. The data obtained and the construction of the tables are discussed and the data compared with those from Sweden.

567. Stand Tables

859. TRIJONO, and HARRIS, M. Tabel djumlah batang sementara untuk *Agathis loranthifolia* Salisb. **[Preliminary stand table for *A. loranthifolia.*]** *Commun. For. Res. Inst., Bogor* No. 64, 1958. pp. 16 + 4 gphs., 4 tbls. 8 refs. [Jav.e.*e.*]

As an auxiliary to the yield tables [see *F.A.* 18 No. 3204].

569. Increment; Development and Structure of Stands: Miscellaneous

860. WECK, J. Regenwälder, eine vergleichende Studie forstlichen Produktionspotentials. **[Rain forests, a comparative study of their production potential.]** *Repr.* from *Erde, Berlin* 90 (1), 1959 (10–37 + 9 photos). 39 refs. [G.e.]

Describes 3 types of rain forest, the tropical lowland, tropical montane and temperate (Laurel forests without dry periods), their climatic limits, structure, composition and distribution, estimating the total extent of primary or mature secondary tropical rain forest as no more than 488 million ha. On the basis of a modified CVP index for the assimilation potential, of which certain %s, varying from 0·14 to 0·32 are taken to represent wood increment on optimum sites (and with further reductions for average sites, harvest losses etc.), the mean productivity is estimated at 3–3·5 tons dry weight/ha./year for tropical and 8·4 tons for temperate rain forest (montane deciduous forest in moist Central Europe, 2–6 tons). [Cf. *F.A.* 19 No. 2134.]

861. HIRAI, S. **[Studies on weight growth of forest trees. VI. *Chamaecyparis obtusa* Endlicher of the Tokyo University Forest in Chiba.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (199–217). 10 refs. [Jap.e.*e.*]

[Cf. *F.A.* 17 No. 3227.] A study was made of 28 sample trees from a 28-year-old plantation, and distribution of basic density (b.d.) calculated from

oven-dry weight and green volume was examined for each tree. In general, wood was heavy at the centre at all levels but heaviest at the top and lightest in the middle sections, becoming heavier again at the base. Volume and weight increment were calculated for 17 sample trees, which all showed max. volume c.a.i. at 20–25 years of age; 15 of them showed simultaneous max. weight c.a.i., but the other two had not reached this at 28 years. Standard b.d. of individuals, obtained by dividing total weight increment by total volume increment, tended to be in inverse ratio to total volume increment. Mean total weight/ha. was 66,911 kg. (2390 kg./ha./year).

58. Surveying and Mapping. Aerial Survey

See also Nos. 6–7, 97.

862. PREDESCU, G., and STĂNESCU, M. Studiul metodelor de ridicare în plan a parcelarului pădurilor de munte. **[Methods of surveying for the lay-out of compartments in mountain forests.]** *An. Inst. Cerc. Silv., Bucureşti* (*Ser. I*) 18, 1957 (189–202). 15 refs. [Rum.russ.f.]

A study was made to determine the relative accuracy and efficiency of surveying (*a*) by the method of adjacent polygons, and (*b*) by compass traverse, compared with (*c*) classic triangulation. It is concluded that (*a*) may replace (*c*) for areas > 700 ha., provided that the survey progresses outwards from a central polygon, and that no point is further than 1500 m. in a straight line from the initial point of this central polygon. Method (*a*), based on tacheometric surveying should permit the determination of areas with errors > ± 1%. This degree of accuracy cannot be obtained in the mountains by method (*b*).

863. SEELY, H. E. **Some developments in photogrammetry.** *Pulp Paper Mag. Can.* 60 (6), 1959 (156 . . . 160).

A general review, covering sampling by large-scale photographs, stratification, photogrammetric methods of determining tree height, camouflage detection film, Aero Ektacolour photography, aids to recognition of species, etc.

864. MEYER, M. P., and TRANTOW, L. H. **A comparison of 6 inch Planigon lens with conventional 8·25 inch lens aerial photography for forestry purposes.** *J. For.* 57 (9), 1959 (634–6). 5 refs.

Describes a series of tests from which it was concluded that: (1) radial distortion of photo images is not a limiting factor in the use of a 6-in. Planigon (distortion-free) lens in forestry photography where scales of 1 : 15,840 or less are employed. (2) Panchromatic photography (1 : 15,840) with a distortion-free 6-in. lens can produce better over-all stereoscopic image detail than is obtainable with a conventional 8·25-in. lens at the same scale. (3) Reduction in scale of 6-in. distortion-free lens photographs from 1 : 15,840 to 1 : 24,000 significantly reduces the reliability of measurements and/or estimates of stereophoto image dimensions. (4) The photo image detail of the 1 : 15,840 scale photographs taken with a 6-in. lens and normally exposed and developed is considered superior to that of all the other types tested. *Author's summary.*

865. MOESSNER, K. E. **Stereograms in Ponderosa Pine.** *Res. Note Intermt. For. Range Exp. Sta.* No. 60, 1958. pp. 3.

A series of 39 stereograms of the combined vertical and horizontal type [cf. *F.A.* 18 No. 1997] are available, showing Ponderosa Pine and accompanying species of different stand size, density, age and site, in national forests of southern Idaho, Colorado and the Black Hills of S. Dakota.

866. BROWN, G. S. **Bird's eye view.** *Malay. Forester* 22 (3), 1959 (208–12 + 8 photos).

Notes on the value of low-level visual reconnaissance from the air for foresters in Malaya, with examples from the author's own experience.

6. FOREST MANAGEMENT. BUSINESS ECONOMICS OF FORESTRY. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

See also Nos. 4–5, 1292.

61. Forest Management: General, Theory and Principles

See also Nos. 325, 1256.

867. DISSESCU, R., and POPESCU-ZELETIN, I. Vîrsta exploatabilităţii arboretelor echiene de brad. **[Age of exploitability of even-aged stands of *Abies alba*.]** *An. Inst. Cerc. Silv., Bucureşti* (*Ser. I*) 18, 1957 (171–88). 13 refs. [Rum.russ.f.]

The authors' method of determining exploitable age from volume of the stand mean tree [cf. *F.A.* 18 No. 790], originally developed for Spruce, is here applied to even-aged Silver Fir. 'Absolute exploitable age' [i.e. of maximum volume production] is ca. 10 years more than that of Spruce, and equal to that of Beech, but technical exploitable age is about the same, for the same assortments, as that of Spruce, and lower than that of Beech.

868. TIWARI, S. D. N. **Pattern of coupes in selection forests.** *Indian For.* 85 (9), 1959 (542–4 + 2 gphs.). 19 refs.

Develops formulae for use in selection forest where crop trees are distributed evenly over the whole area, to replace formulae developed earlier for use in virgin forest during the first one or two felling cycles [cf. *F.A.* 18 No. 797].

62. Working Plans. Annual or Periodic Yield. Yield Regulation

See also No. 868.

869. KLEPAC, D. Mjera za podizanje šumske proizvodnje. **[Measures for increasing forest productivity.]** *Šumarstvo* 11 (9/12), 1958 (557–71). [Croat. e.f.]

Describes possible measures, classed as either

'classical' i.e. based on manipulation of the form of management, rotation, silvicultural treatment etc., or 'modern', using agricultural techniques for site improvement, and selection and breeding to improve the growth rate. The recommendations of an FAO expert on the introduction of fast-growing species into Jugoslavia are also presented.

870. Ilvessalo, Y. Metsiemme hakkuusuunnite. **[The allowable cut.]** *Metsät. Aikak.* 1958 (11), (376–80). [Fi.]

Indicates the allowable cut for Finnish forests in the light of the third national survey and gives the different alternatives for an allowable cut, their magnitude and composition by species.

64. Forestry as a Business: General

See also Nos. 881, 888, 1282, 1295.

871. Gordon, W. A. **Some theoretical influences of legislation on British woodland management.** *Emp. For. Rev.* 38 (3), 1959 (250–4).

Discusses the effects of the tax laws (Income Tax and Death Duty), the Settled Land Acts (defining the right to income of the tenant for life) and the Forestry Acts (providing subsidies for afforestation and maintenance). It is suggested that, if their implications were given full weight in private woodland management, they would on balance favour short against long rotations, conifers against hardwoods, even-aged against uneven-aged forest and artificial against natural regeneration.

872. Mosher, M. M. **The economic value of seventeen western Washington farm forests.** *Bull. Wash. St. Agric. Exp. Sta.* No. 596, 1958. pp. 27.

The cases reviewed showed that the woodland part of the farm, although making up only 33·9% of the land area, returned 49·8% of the farm income over a period of 10 years, and required only 7% of the farmer's time.

873. Clauser, F. Una società anonima 'pel rimboschimento dei monti del Casentino'. **[A limited liability company 'for the reforestation of the mountains of the Casentino'.]** *Monti e Boschi* 10 (6), 1959 (265–70). [It.f.e.]

An account of a company founded in 1846, quoting the original prospectus and calculations of interest, and describing modern afforestation in the same area.

65. Special Business Problems of Timber-Growing. Calculation of Costs and Profitability. Valuation

See also Nos. 368, 371, 465, 1298–1300.

874. Hedemann-Gade, E. Svenskt skogsbruk av idag sett ur lönsamhetssynpunkt. **[The profitability of Swedish forestry today.]** *Svenska Skogsv-Fören. Tidskr.* 57 (2), 1959 (265–80). 1 ref. [Sw.sw.]

Presents and discusses figures for an enterprise of 1000 ha., adapted from the account of a mixed forest estate in Central Sweden, showing that of a gross profit of Kr. 47,000, Kr. 30,000 would be absorbed by communal, income, and property taxes, insurance etc., leaving a net return of 1·8% on the assessed capital value of Kr. 900,000. A plea is made for changes in taxation and particularly in assessment principles.

875. Švec, J. Příspěvek k oceňování lesů podle zásad marxistické ekonomie. Praktická část. **[Forest valuation according to Marxist economics. (Practice).]** *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 5 (6), 1959 (579–600). 8 refs. [Cz.cz.russ.e.]

[Cf. *F.A.* 20 No. 5045.] Develops formulae for forest valuation, which, in accordance with Marxist theory, ignore the forest land itself, as having no value.

876. Jørgensen, F., Opheim, T., and Svendsrud, A. Hjelpetabeller for skogøkonomiske kalkyler: gran i Trøndelag. **[Auxiliary tables for forest economic calculations: Spruce in Trøndelag.]** *Meld. Inst. Skogøkon. Norges LandbrHøgsk.* No. 13, 1959. pp. 36 + 21 gphs. 13 refs. [Nor.nor.]

Presents data similar to those already published for E. Norway [see *F.A.* 19 No. 3331].

877. Stoltenberg, C. H. **An investment opportunity approach to forestry programming.** *J. For.* 57 (8), 1959 (547–50). 7 refs.

Discusses the need for an investment-rating system, so that, as far as possible, available funds are directed to those practices and those stands that will yield the greatest return per unit of cash invested.

878. Kamino, S. **[An economic analysis of farm forestry.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 106, 1958 (1–65). 30 refs. [Jap.jap.e.]

A theoretical analysis of conditions, possible improvements, and types of suitable management plans. It would be for the owner to decide between several plans according to his needs—e.g. maximum regular income, maximum reserve for major contingencies, or for some foreseeable future need. *From author's summary.*

66. Costing of Logging Operations

See also No. 546.

879. Houtermans, P. Schlepper-Buchführung und Schlepper-Einsatz. **[Tractor accounting and tractor use.]** *Allg. Forstzeitschr.* 14 (37), 1959 (653–6). 20 refs. [G.]

Discusses the collection of the (comparatively few) data required for calculating costs, performance etc. for the machines as a whole or for different uses, particularly skidding, including a comparison of data presented by different (German) authors.

68. Administration and Organization of Forest Enterprises

683. ffice Organization

See No. 5.

686. Planning and Organization of Buildings, Transport Installations (Roads etc.)

See No. 519.

687. Planning and Organization of the Transport of Men, Supplies and Equipment

880. MURPHY, J. L. **Helispot location and construction.** *Misc. Pap. Pacif. Sthwest. For. Range Exp. Sta.* No. 31, 1959. pp. 18.

Following some basic considerations about the nature of helicopter flight, gives practical advice on the siting and construction of temporary landing spots, such as ridges or knolls in wooded areas. Instructions are given for mapping and recording these, and a sample 'helispot' information form is appended with provision for details on the topography of the site and adjacent cover type (whether timber, brush, etc.).

7. MARKETING. ECONOMICS OF TRANSPORT AND THE FOREST PRODUCTS INDUSTRIES

See also Nos. 1292, 1297.

71. Marketing of Forest Products: General

See also Nos. 324, 342, 1244, 1295.

881. BRUCE, R. W. **Marketing sawlogs and pulpwood from small woodland holdings [in Washington].** *Bull. Wash. St. Agric. Exp. Sta.* No. 599, 1959. pp. 31. 5 refs.

72. The Quantitative Aspects of Marketing. Demand, Consumption and Supply

See also No. 1268.

882. **Timber statistics 1958.** Organisation for European Economic Co-operation, Paris. 1959. pp. 70. [E.F.] Price 7*s.* 6*d.*

[Cf. *F.A.* 20 No. 2219.]

883. RICHARDS, E. G. **Fast-grown coniferous timber market trends.** *Quart. J. For.* 53 (3), 1959 (243–7).

Examines the position in the U.K. with regard to building timbers, packaging timbers and pulpwoods. Prospects for fast-grown softwoods appear better than ever before.

884. ŽUMER, L. Študija o našem izvozu lesa. **[Studies of Jugoslavian wood exports.]** *Les, Ljubljana* 11 (2/3), 1959 (17–23). [Sloven.e.g.]

Gives data covering the period 1948–57. Exports are divided into 3 main groups: round and sawn timber, finished goods, and chemical products, and these groups subdivided into 23 categories. Some data are included for wood exports from Slovenia, 1951–58.

73. Prices

885. MCCLAY, T. A. **Seasonal fluctuations in Ponderosa Pine lumber prices.** *J. For.* 57 (9), 1959 (644–7).

A graphic and statistical analysis was made of the Western Pine Association's average index prices for Ponderosa Pine lumber from 1936 to 1955. Analysis of variance revealed significant upward trends in prices and a lack of consistent seasonal variation. Graphic tests showed that although certain seasons of the year tended to be associated with above- or below-average prices, there was no consistent and predictable pattern from year to year, and the average difference between high and low seasonal prices was negligible. *From author's summary.*

886. KIENITZ, E., and BREITHAUPT, G. Sozialistische Preisrelationen für Rohholz als forstliche Rentabilitätsweiser. **[The price relations of assortments in the rough in a socialist economy as indicators of profitability in forestry.]** *Suppl.* to *Forst u. Jagd* 9 (6), 1959. pp. 11. 5 refs. [G.]

Stresses the need for economic thinking in the planning of production and particularly in sorting, and presents many schedules of official prices for various species and types of wood, from veneer logs to fuelwood.

74. Trade Policy

See also No. 1295.

887. STOFFELS, A. Die niederländische Forst- und Holzwirtschaft in der Europäischen Wirtschaftsgemeinschaft. **[Dutch forestry and forest products industry in the Common Market.]** *Allg. Forstzeitschr.* 14 (31), 1959 (545–7). 8 refs. [G.]

Since, like the other members, Holland imports most of its wood from non-member states, a common market or joint external tariff for wood is neither desired nor expected. While coordination and cooperation between member states is welcomed, duplication of effort with other agencies (FAO, OEEC etc.) and separation from non-members ought to be avoided.

78. Economics of Transport

See also No. 1149.

888. ROITTO, Y. **Inaccessible forests as a costing problem.** *Pulp Paper Mag. Can.* 60 (8), 1959 (134–8). 15 refs.

From the angle of business accounting, discusses theoretically the making of inaccessible forests economically exploitable. The main problem examined is how transport costs are affected by distance, in the context of long-distance transport of roundwood in towed bundle rafts in Finland.

889. VLASOV, D. I., and ŠČERBAKOV, A. E. Paketnoe hranenie pilomaterialov v Leningradskom lesnom porty. **[Storage of packaged sawn timber at Leningrad's timber port.]** *Lesn. Prom.* 1959 (6), (18–9). [Russ.]

Reviews methods used since 1957 to package boards ≤ 21 ft. long for storage, seasoning, and shipment [to the U.K.], in standard 21-ft.-long packages of widths suitable for transport by Valmet [Finnish] straddle-carriers. The use of roof sections to cover stacks, and the increased output and economies possible by packaging, are also discussed.

79. Economics of the Forest Products Industries

See also Nos. 1074, 1245.

890. **Chile, potential pulp and paper exporter.** Expanded Technical Assistance Program, FAO, Rome. *FAO/ETAP* No. 560/Rev. 1, 1957. pp. ix + 187 + 1 map.

Conditions are thought to be favourable to the creation of an export industry, based on *Pinus radiata*, though transport is a problem.

891. BERTHON, P. Informe al gobierno de Bolivia sobre la creación de nuevas industrias forestales y la modernización de los aserraderos. **[Report to the government of Bolivia on the creation of new forest industries and the modernization of sawmills.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 962, 1959. pp. ii + 127. [Span.] Limited distribution.

Presents data collected in the principal forest regions on exploitation, extraction, regeneration, sawmilling and marketing (and, in *Schinopsis* areas, the tannin industry), with recommendations for future development.

892. BUDNIAK, F. Zagadnienie opłacalności przerobu drewna w poszczególnych gałęziach przemysłu. **[The profitability of wood conversion in the individual branches of the industry.]** *Sylwan* 103 (3), 1959 (99–117 + 1 tbl.). 5 refs. [Pol.russ.e.]

Analyses the costs of the raw wood at the mill, conversion costs, overheads, selling prices etc., and, for both the home and export market, the value of *W* (i.e. the value of 1 cu.m. of raw wood at the mill + the accumulated value accrued during conversion and processing). From this, conclusions are drawn on the relative profitability of various methods of conversion: e.g. chemical or mechanical, fibreboard or particle board manufacture, plywood or solid wood production, etc.

8. FOREST PRODUCTS AND THEIR UTILIZATION

893. **Program of work 1959 . . . 1960 of the Forest Products Laboratories of Canada, Ottawa and Vancouver.** Forestry Branch, Ottawa. 1959. pp. 66.

894. **Research program for industrial development: fiscal year 1959–1960.** Forest Products Research Institute, College, Laguna, Philippines. 1959. pp. 139.

Brief accounts of research projects on wood chemistry, timber physics, wood preservation and wood technology.

810. General Information on Woods

See also Nos. 155, 317, 360, 362, 1070.

895. REHMAN, M. A. **Utilization of less valuable species of timbers of India.** *Indian For.* 85 (9), 1959 (555–61).

Out of a large number of species of woods growing in India only a few [*Cedrus deodara*, *Tectona grandis*, *Shorea robusta*, *Dalbergia sissoo*, *D. latifolia*, *Pinus roxburghii* and *Bombax malabaricum*] have till recently been commercially exploited and extensively used. About 30–40 species that fall in the category of less valuable species are also in use owing to their suitability for specific purposes. These timbers are briefly discussed in the paper. A list of less valuable timbers that can be put to major uses after seasoning only, or after seasoning and preservative treatment, is also given. *From author's summary.*

896. SPALT, H. A., and STERN, W. L. **Survey of African woods. IV.** *Trop. Woods* No. 110, 1959 (42–115). 59 refs.

Descriptions of *Maesopsis eminii*, *Mansonia altissima*, *Mimusops heckelii*, *Mitragyna* spp., *Ocotea bullata*, *O. usambarensis*, *Olea hochstetteri*, *Parinari excelsa*, *Petersia africana*, *Piptadeniastrum africanum*, *Pterocarpus angolensis*, *P. soyauxii*, *Sarcocephalus diderrichii*, *Scotellia kamerunensis*, *Sterculia oblonga*, *S. rhinopetala*, *Tarrietia utilis*, *Terminalia ivorensis*, *T. superba*, *Triplochiton scleroxylon*, *Turraeanthus africana*, *Juniperus procera* and *Podocarpus* spp.

897. **Notes on the utilisation of certain species at present being sawn for timber in Nyasaland. Bulletin 1.** *Nyasald. Fmr. For.* 4 (4), 1959 (14–22). 5 refs.

Notes on wood properties and uses of *Pinus patula*, *Cupressus lindleyi*, *Widdringtonia whytei*, and *Pterocarpus angolensis.*

898. FREITAS, M. C. P. G. DE. Estudos das madeiras de Timor. II. Contribuição. **[The timbers of Timor. Second part.]** *Mem. Junta Invest. Ultramar, Lisboa (Ser. 2)* No. 5, 1958. pp. 89 + 19 plates. 49 refs. [Port.]

[Cf. *F.A.* 18 No. 4501.] Presents information on the nomenclature, range, aspect of the tree, physical properties, anatomy and uses of the wood of a further 19 species.

899. **[Outline of important Japanese woods.]** *Suppls.* to *Wood Ind., Tokyo* 14 (7; 8), 1959. Each pp. 2. [Jap.] P.R.

Anatomy, mechanical and physical properties etc., of *Pseudotsuga japonica* and *Torreya nucifera.*

900. **Specimen woods Nos. 283–4.** *Suppls.* to *Wood* 24 (7; 8), 1959. Each pp.2.

Miro (*Podocarpus ferrugineus*); and Basralocus (*Dicorynia paraensis*).

901. ARKWRIGHT, P. **Know your timber: Nos. 64–65.** *Woodwkg. Ind.* 16 (7; 8), 1959 (377; 430). P.R.

Lignum Vitae (*Guaiacum officinale*); and American Whitewood (*Liriodendron tulipifera*).

902. **Properties of thinnings of home-grown Scots Pine (*Pinus sylvestris*). Progress report 5—Consignment No. 956.** Forest Products Research Laboratory, Princes Risborough. 1959. pp. 13 + 7 photos.

[Cf. *F.A.* 19 No. 889.] Material studied comprised 38 trees from a naturally-regenerated crop, 43–54 years old, at Thetford Chase, Suffolk.

903. **Combined report on the properties of thinnings of home-grown Douglas Fir (*Pseudotsuga taxifolia*).** Forest Products Research Laboratory, Princes Risborough. 1959. pp. 13 + 1 gph., 11 photos.

[Cf. *F.A.* 19 No. 4714.] Summarizes results for the 8 consignments tested in recent years, concluding that the home-grown timber has satisfactory seasoning and woodworking properties, and discussing its uses compared with those of imported material.

904. QUIQUANDON, B. Le bois de Douglas provenant des reboisements français. **[The wood of Douglas Fir from French forests.]** *Rev. Bois Appl.* 14 (7), 1959 (23–7). 5 refs. [F.]

Discusses the introduction of Douglas to France, its use in plantations, and its present and future yield. The appearance of the wood, its anatomical features, durability, behaviour in sawing, physical and mechanical properties, workability and uses are reviewed on the basis of tests on samples of 40- to 60-year French-grown Douglas at the Centre Technique du Bois.

905. SAMAPUDDHI, K. **A preliminary study in the structure and some properties of some Thai Bamboos.** [*Publication*] *Royal Forest Department, Bangkok* No. *R.*30, 1959. pp. 19. 4 refs. [E.]

The 34 species of Bamboo common in Thailand are shown in a table giving local and scientific name, culm diameter, and distribution. Species studied were *Bambusa tulda, Cephalostachyum pergracile, Oxytenanthera albociliata, Dendrocalamus membranaceus* and *D. giganteus.* Their microscopic structure is discussed and illustrated with photomicrographs. Measurements of the macerated fibres are tabulated and show that *B. tulda* and *D. membranaceus* have exceptionally long fibres; they are recommended for pulping trials. Silica content was similar for all species, 0·018–0·020% in the peripheral or 'skin' zone, 0·0009–0·0031% in the inner zone. Starch content was low, 0·019–0·088%, and only traces of starch remained after test pieces had been submerged in running water for 10 days.

906. BETTS, H. S. **Maple (*Acer* species.)** *Amer. Woods U.S. For. Serv.* (Rev.) 1959. pp. 12. 15 refs. Price 10 cents.

907. GHELMEZIU, N. Proprietăţile lemnului de fag şi modificările acestora, în urma tratamentelor de protecţie şi ameliorare. **[The properties of Beech wood and their modification by treatments designed to protect or improve it.]** *Industr. Lemn.* 7 (6; 7), 1958 (204–13; 248–56). 42 refs. [Rum.russ.g.f.e.]

Describes the anatomy and physical and mechanical properties of the wood and its peculiarities (e.g. red heart and tension wood), and its principal uses. A large part of the article is devoted to treatment by steaming.

908. **Properties of Australian timbers: Mountain Ash [*Eucalyptus regnans*].** *For. Prod. Newslett. C.S.I.R.O. Aust.* No. 252, 1959 (3–4).

Habit and distribution of the tree, chemical, physical and working properties of the wood, seasoning, uses and availability.

909. **Grey Box [*Eucalyptus hemiphloia*].** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 11 (3), 1958 (13–7).

Its distribution in Australia, botanical description and description of the wood, uses, working properties, seasoning and durability, with tabulated data on mechanical and physical properties.

910. **Blush Tulip Oak.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 11 (4), 1959 (6–9). 2 refs.

Gives details of the distribution of *Tarrietia actinophylla* in New South Wales (map) and Queensland, botanical description and description of the wood, uses, working properties, seasoning and durability, with tabulated data on physical and mechanical properties.

911. ZAVADIL, A. Technické vlastností korkovníku amurského (*Phellodendron amurense* Rupr.) a možnost jejich využití. **[The technical properties of *P. amurense* and its possible utilization.]** *Věd. Práce Výzkum. Ust. Lesa Mysl., Praha* No. 2, 1958 (35–59). 20 refs. [Cz.russ.g.]

Discusses the importance of the species as a cork producer, and examines the technical properties of its timber, mainly on the basis of Soviet literature [cf. *F.A.* 20 No. 3025].

811. Structure, Identification

See also Nos. 905, 931.

912. LARSON, P. R. **Preparation of small wood blocks for photomicrography.** *Stain Technology, Baltimore* 34 (3), 1959 (155–6). O.R.S.

A technique to increase the contrast between various wood elements consists of (1) preparing a smooth cross-sectional surface on a sliding microtome; (2) thorough drying of the specimen; (3) rubbing the prepared surface on a glass plate covered with finely ground, levigated Al_2O_3; and (4) removing excess Al_2O_3 powder and polishing the surface with a soft cloth. The powder completely seals the cell lumens, resin ducts, wood rays and other exposed openings on the wood surface, but leaves the cell-walls clearly visible; in some woods the cellular outline is accentuated as a result of the polishing. Photomicrographs illustrate Slash Pine and White Oak blocks before and after surface preparation.

913. PLATH, E., and PLATH, L. Färbemethoden für Mikrotomschnitte aus verleimten und oberflächenbehandelten Holzwerkstoffen. **[Staining methods for microsections made from glued and surface-treated wood and wood-based materials.]** *Holz Roh- u. Werkstoff* 17 (6), 1959 (245–9 + 5 coloured photos). 5 refs. [G.g.e.] P.R.

Discusses making the sections, choice of stains, and the ability of glues and lacquers to be stained,

and describes, with coloured photographs, nine examples of the use and advantages of microscopic staining techniques.

914. CH'ENG, T.-C. **[The anatomical features and uses of the gymnospermous woods of China.]** Institute of Forest Products, Peking. 1958. pp. 74 + 6 pp. of tbls. 96 refs. [Chin.e.e.]

Contains a key to the genera of the Ginkgoales and Coniferales, and anatomical descriptions, with 165 photomicrographs, of the families and genera, together with suggestions for revision of nomenclature in some cases.

915. MCLAUGHLIN, J. **The woods and flora of the Florida Keys. Wood anatomy and phylogeny of Batidaceae.** *Trop. Woods* No. 110, 1959 (1–15 + 1 plate). 35 refs.

Study of the wood anatomy of *Batis maritima* leads to the conclusion that Batidaceae (only two species) is an isolated, reduced family and should be placed in an order by itself, the Batidales, considered as allied to the Centrospermae.

916. KOBAYASHI, Y., SUDO, S., and SUGAWA, T. **[Anatomical studies on the woods of Phdiek, Chhoeutéal and Koki from Cambodia.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 106, 1958 (217–27 + 3 plates). 7 refs. [Jap.jap.e.]

The authors describe and illustrate woods marketed under these names in Cambodia, and identify them as *Anisoptera glabra*, *Dipterocarpus* sp., and *Hopea odorata* respectively. They had some difficulty in applying Reyes' Key to Dipterocarpaceae [cf. *F.A.* 2 p. 259], and propose its revision, still on the basis of resin ducts. *From authors' summary.*

917. SAMAPUDDHI, K. **A note on preliminary studies in some methods of identifying the timbers of *Pentacme siamensis*, Kurz., *Shorea obtusa*, Wall., and *Shorea robusta*, Gaertn. f.** [*Publication*] *Royal Forest Department, Bangkok* No. *R*24, 1957. pp. 5 + 4 tbls., 9 photos. [E.]

The species could be distinguished by the presence or absence of rhomboid crystals in the ray cells, ash colour, colour of secondary alcoholic extract, and chromatographic analysis of the alcoholic extract.

918. SHIMAJI, K. **Anatomical studies on the wood of the Japanese *Pasania*, *Castanea* and *Castanopsis*. (With a key to the 22 Japanese representative species of the Fagaceae.)** *Bull. Tokyo Univ. For.* No. 55, 1959 (81–99 + 7 plates). 15 refs. [E.e.jap.]

Detailed studies of *Pasania edulis*, *P. sieboldiana*, *Castanea crenata*, *Castanopsis cuspidata* and *C. cuspidata* var. *sieboldii*. The key to the Fagaceae is based on wood-anatomical characters. [Cf. *F.A.* 14 No. 2605; 15 No. 4012; 16 No. 4477.]

811.1. Anatomical Elements and Tissues

See also Nos. 127, 905, 935, 957, 977, 1014.

919. **Anatomical investigations. (i) Bark. (ii) Pit structure.** *Extr.* from *Rep. For. Prod. Aust. 1958/59*, 1959 (4 + 1 photo).

(i) The barks of 82 species of *Eugenia* s.l. have been examined. The separation into *Eugenia* A and *Eugenia* B on the basis of wood anatomy has been upheld by features of bark anatomy, thus supporting the suggestion that the species of *Eugenia* from the Old World should be separated from those of the New World. (ii) It has been shown by optical and electron microscopy that the membrane of the pits in *Eucalyptus regnans* retains the essential structure of the primary wall. In consequence it offers much greater resistance to the movement of particulate suspensions than the perforated membranes in coniferous woods. The pit borders in fibres and tracheids consist of a circular ring of microfibrils, but in vessel elements the initial deposition of the border is common to a number of pit fields.

920. JAYNE, B. A. **Mechanical properties of wood fibers.** *Tappi* 42 (6), 1959 (461–7). 14 refs. P.R.

Describes a technique for measuring the tensile mechanical properties of single fibres, using a conventional testing machine with specially made small grips to hold the ends of the fibres. The results of several tests on 3 conifers [*Pseudotsuga taxifolia*, *Taxodium distichum* and *Picea glauca*] showed inherent differences in the load-deformation relationship in early-wood compared with late-wood fibres, probably caused by variations in the minute structure of the cell-wall. The existence of a limit of proportionality between stress and strain indicates that the fibres possess viscoelastic characteristics. It is suggested that a complete description of their properties must rely on several types of fundamental mechanical test, all recognizing time as a variable. *From author's summary.*

921. SÁRKÁNY, S., and STIEBER, J. Untersuchungen über die quantitativ-ökologische Xylotomie von *Fagus sylvatica*. **[Studies on the quantitative xylotomy of *F. sylvatica*.]** *Repr.* from *Annales Universitatis Scientiarum Budapestinensis* (*Sect. Biol.*) No. 2, 1959 (239–57). 11 refs. [G.g.e. russ.] X.

[Cf. *F.A.* 20 No. 2258.] Presents graphs of results of measurements on 8 trees from the Bükk and Mátra mountains, showing variations with position from pith to cortex of annual-ring width, and volume % and number of vessels and fibres. No definite conclusions can be drawn until more material is examined.

922. SIMIĆ, P. Prilog poznavanju anatomske građe bukovog drveta vrste *Fagus moesiaca* iz Karaormana. **[The anatomical structure of *Fagus moesiaca* from Karaorman [Macedonia].]** *God. Zborn. Zemj. Šum. Fak. Univ. Skopje (Šum.)* No. 10, 1956/1957 (217–52 + 1 tbl.). 26 refs. [Serb.serb.e.e.]

A microscopic examination was made of Beech wood samples, taken at different stem heights from 5 trees growing near Ohrid. The proportion of rays 1–5 cell-rows wide amounted to 94%; those > 5 rows wide only 6%. Ray height varied from 1 to 200 cell-rows, and a positive correlation was established between ray width and mean height. Ray height was also correlated with the stem height at which samples were taken. The volume % of rays in wood tissues decreased with height up the

tree, varying from 23·5 to 39·3%. The mean size of ray cells varied from 8·4 to 14·3μ. Fusiform cells were found in *F. moesiaca.*

923. BARDINSKAJA, M. S. K voprosu ob obrazovanii odrevesnevših kletočnyh stenok. [**On the formation of lignified cell-walls.**] *Fiziol. Rast.* 6 (3), 1959 (336–46). 71 refs. [Russ.] A.P.B.

A review of world literature.

924. NARAYANAMURTI, D., and PRASAD, B. N. Untersuchung einiger indischer Holzarten durch Röntgen-Beugungsdiagramme. [**Examination of some Indian woods by X-ray diffraction diagrams.**] *Holz Roh- u. Werkstoff* 17 (6), 1959 (223–6). 18 refs. [G.g.e.] P.R.

X-ray examination of veneers 80μ thick showed the following to have a parallel micellar structure: *Abies pindrow, Acacia* sp., *A. catechu, Adina cordifolia, Anogeissus acuminata, Anthocephalus cadamba, Cedrela toona, Dichopsis elliptica, Diospyros* sp. (heartwood only), *Dipterocarpus* sp., *Dysoxylum malabaricum, Eucalyptus* sp., *Eugenia* sp., *Fagus sylvatica, Gluta travancorica, Holoptelea integrifolia, Hopea parviflora, Juglans regia, Mitragyna parvifolia, Myristica malabarica, Ochroma* sp., *Picea morinda, Pinus excelsa, P. longifolia, Stereospermum chelonoides, Terminalia bialata, T. tomentosa, Vateria indica,* and *Zanthoxylum rhetsa.* In the following the micellar directions vary uniformly within a measured angle: *Artocarpus integrifolius, Cedrus deodara, Cryptomeria japonica, Dalbergia latifolia, D. sissoo, Diospyros* sp. (sapwood), *Fraxinus* sp., *Lagerstroemia flos-reginae, Mangifera indica, Michelia* sp., *Ougeinia dalbergioides, Pterocarpus macrocarpus, P. santalinus, Santalum album, Schrebera swietenioides* and *Tectona grandis.* In *Alnus nitida, Canarium* sp., and *Hardwickia pinnata* there is a mixed diagram, and in *Taxus baccata* two opposed spirals.

925. JAYME, G., and KOBURG, E. Über den elektronenoptisch bestimmten Durchmesser der Mikrofibrillen von Laubholzzellelementen. [**Diameters of microfibrils of xylem elements of various hardwoods, as determined under the electron microscope.**] *Holzforschung, Berlin* 13 (2), 1959 (37–43). 7 refs. [G.g.e.] P.R.

Measurements on Beech sulphite pulp and on sulphate pulps of Chestnut, Poplar, Birch, *Eucalyptus* sp. and *Musanga smithii* showed microfibril diameters ranging from 90 to 230Å, while Spruce sulphite pulps showed 210–290Å. The diameter range was very similar for all the hardwoods except *M. smithii,* where it was lower (90–180Å). The microfibrils could be followed for lengths of 1–2μ without finding any definite end. The wide variation of microfibril diameter within a species may be caused by different growth conditions.

926. **The nature of the warts in conifer tracheids.** *Extr.* from *Rep. For. Prod. Aust. 1958/59,* 1959 (6).

[Cf. *F.A.* 18 No. 862.] These are excrescences on the cell-wall, the significance of which is unknown, but they are considered to play a part in governing the penetration of liquids into wood. Their structure has been investigated in a variety of gymnosperms and methods devised by which they can be isolated. They have been found to consist of a membrane folded into a series of pouches protruding into a cell lumen. In these are spherical objects which appear to be extremely dense. Development of the warts occurs late in the differentiation of the cell-wall after lignification. Chemically they are extremely consistent and their solubility properties resemble those of sporopollen.

927. BANNAN, M. W. **Girth increase in White Cedar stems of irregular form.** *Canad. J. Bot.* 35 (4), 1957 (425–34 + 1 plate). 29 refs. O.R.S.

The rate of multiplication of fusiform initials in the vascular cambium of conifers often fluctuates considerably around the circumference. In fluted stems the frequency of these divisions is appreciably higher, and the ratio of survival of the newly formed initials relative to the rate of production lower, in the depressions than in the adjoining convex portions of the perimeter. The probability that compression is a factor tending to accelerate the frequency of the anticlinal division is indicated by the decided increase in rate in areas of the stem subjected to radial pressure. Higher frequencies of pseudotransverse division are accompanied by reduction in mean cell length of the cambial cells and hence of the derived wood elements. *Author's summary.*

928. PEEL, J. D. **Fibre dimensions of suggested pulpwood plantation species.** *Malay. Forester* 22 (3), 1959 (238–9 + 1 tbl.). 6 refs.

The fibre lengths, diameters, and cell-wall thicknesses are reported of 35 exotic and indigenous species that have been suggested as possibly suitable for pulpwood plantations. The conifers all furnished relatively long fibres but the high sp. gr. of *Pinus caribaea* and *P. insularis* necessitates their early chemical investigation. Nineteen broadleaved species possessed high coefficients of flexibility; it is intended to examine *Albizzia falcata, Gmelina arborea* and *Macaranga* spp. first, since more is known of their growth characteristics. *From author's summary.*

929. **Investigation of the suitability of Indian timbers for the production of cellulose.** *Extr.* from *For. Res. India Burma 1955–56, Pt. 1,* 1958 (75).

A study of the fibres of *Dendrocalamus strictus* and *Bambusa arundinacea* showed that the mean length of the cap fibres was significantly greater than that of xylem fibres, which, in turn, were significantly larger than phloem fibres. Observations on *Melocanna bambusoides* showed that fibre length gradually increased up the culm as far as the 16th internode and then tended to decrease. The largest fibres and the longest vessels were found in the longest internodes.

930. **Anatomical study of Indian Bamboos.** *Extr.* from *For. Res. India Burma 1955–56, Pt. 1,* 1958 (75–6).

The occurrence of septate fibres was confirmed in *Dendrocalamus strictus* and *Bambusa arundinacea,* and the formation and structure of such fibres was studied.

931. HUDSON, R. H. **The value of the fusiform ray in separating the genera *Picea* and *Larix*.** *J. Inst. Wood Sci.* No. 2, 1958 (22–30). 6 refs.

A microscopic examination was made of 23 *Picea* and 9 *Larix* species in order to reassess the value of the fusiform ray as a diagnostic feature in separating the two genera, the features selected being (1) resin-duct epithelial cells (the number of epithelial cells per duct being recorded); (2) excentricity of the resin duct; and (3) the ratio between the number of cells in the longer to those in the shorter 'tail' of the ray (only those cells in the uniseriate portion of each 'tail' being counted). None of these features were found to have diagnostic value, *Picea maximowiczii* being the only species conforming wholly to the orthodox criteria.

932. NYRÉN, V., and BACK, E. **Characteristics of parenchymatous cells and tracheidal ray cells of *Pinus silvestris* pulpwood. The resin in parenchymatous cells and resin canals of conifers. III.** *Norsk Skogind.* 13 (8), 1959 (267–78). [E.e.sw.g.] P.R.

With the aid of photomicrographs, distinguishes the different types of tracheidal and parenchymatous ray cells, vertical parenchyma cells, parenchymatous pith cells and epithelial parenchymatous cells occurring within the resin canals, and discusses the relative frequency of ray tracheids and the different parenchyma cells.

933. NYRÉN, V., and BACK, E. **The dimensions of tracheidal and parenchymatous ray cells of *Pinus silvestris* pulpwood. The resin in parenchymatous cells and resin canals of conifers. IV.** *Svensk PappTidn.* 62 (17), 1959 (587–93). 4 refs. [E.e.sw.g.] P.R.

Results based on measurements from pulps and from tangential stemwood sections are given in graphs and tables. They show considerable differences in all dimensions between tracheidal and parenchymatous ray cells, and for the former between cells in the outermost and other cell rows of the ray.

934. ENGSTRÖM, P., and BACK, E. **The proportion of canal resin in *Picea abies* Karst. pulpwood. The resin in parenchymatous cells and resin canals of conifers. VIII.** *Svensk PappTidn.* 62 (16), 1959 (545–53). 22 refs. [E.e.sw.g.] P.R.

[Cf. *F.A.* 20 No. 2270.] Characteristic features of the resin canals are described and discussed. Studies were made on 5 trees of pulpwood size from two localities, both in lat. 60 N., with samples taken from various heights in the tree. The mean relative proportion by weight of canal resin in the total non-volatile resin was calculated to be 45%, with considerable variations between trees, but only small variations between heights within a tree (variation coefficients of 49 and 13% respectively). The fraction of volatile material in the fresh oleoresin (i.e. the canal resin) was determined separately on 7 trees and a mean value of 19% obtained. The total resin canal volume proved to be 3·4%, of the wood volume, 40% made up by radial and 60% by vertical resin canals. Mean lumen volume was 44% and 55% of the total canal volume for radial and vertical canals respectively.

811.2. Special Features and Abnormal Structure

See also Nos. 932–4.

935. CASPERSON, G. Elektronenmikroskopische Untersuchungen des Zellwandaufbaues beim Reaktionsholz der Coniferen. **[Electron miscroscope investigations into the cell-wall structure of reaction wood in conifers.]** *Ber. Dtsch. Bot. Ges.* 72 (5/6), 1959 (230–5 + 1 plate). 25 refs. [G.] O.B.D.

Investigations on branchwood several years old of *Picea pungens* var. *glauca* showed compression wood to be characterized by a special type of cell-wall structure. The cells are rounded, leaving intercellular spaces. The secondary cell-wall has only two layers, the innermost layer being absent, and is characterized by a pattern of radial fissures having an average width of 0·1μ and a spacing of 1–2μ; these are not due to the effects of drying and are not lignified. Lignin is laid down as in normal wood, in lamellae, but in compression wood the concentric arrangement of the lamellae is disturbed by the fact that the secondary cell-wall is fissured, and the lamellae curve towards the lumen. The aberrant cell-wall structure may arise from the fact that a normal rectangular cambium cell has been transformed into a rounded compression-wood cell, but further investigations are needed on this point.

811.4. Growth Rings. Early and Late Wood

See also Nos. 275, 849, 920, 940, 1014, 1155–7.

936. **[Late-wood formation in Red Pine.]** *Extr.* from *Rep. Lake St. For. Exp. Sta. 1958*, 1959 (26).

The physiology of late-wood formation is being studied by regulating the activity of the terminal meristem. Results to date indicate that seedlings maintained under long-day (18-hour) conditions will produce late-wood cells with abnormally thick walls and large lumens. When such seedlings are placed under short-day (8-hour) conditions they will revert to the production of the normal, narrow-lumened, late-wood cells. Seedlings alternated from long-day to short-day to long-day conditions will produce an obvious false ring with the narrow-lumened cells of the short-day type. Similar false rings have been produced by applying IAA to decapitated stem tips of seedlings maintained under short-day conditions.

811.5. Sapwood and Heartwood

See Nos. 940, 1155, 1157–8.

811.6. Texture, Grain, Figure

937. MAYER-WEGELIN, H., and PIEPER, J. Die Zeichnung von Furnierhölzern und ihre Beurteilung nach Merkmalen am Rundholz. **[The figure in veneers and its evaluation from log characteristics.]** *Holz Roh- u. Werkstoff* 17 (8), 1959 (305–12). 10 refs. [G.g.e.] P.R.

Various types of figure are described (giving their German, French and English names) with illustrations, and their causes are discussed. Methods of evaluation include a study of variations in the fibre

direction on the barked log surface for the outer layers, and in end checks or in strips cut radially on the end face of the log for the inner layers.

811.7. Phloem; Bark

See also Nos. 122, 919.

938. ZAHUR, M. S. **Comparative study of secondary phloem of 423 species of woody dicotyledons belonging to 85 families.** *Mem. Cornell Agric. Exp. Sta.* No. 358, 1959. pp. 160. Many refs.

In the present investigation, based on 423 species from 85 families of woody dicotyledons from the temperate and tropical regions (mainly from the Hawaiian Is.), particular attention is paid to the structure and evolution of sieve-tube elements, companion cells, and phloem fibres. The following working hypotheses based on the data presented are made: (1) The delay in specialization of the sieve-tube mother cells, or their retention of meristematic activity over a long period, has been an important factor in the phloem of woody dicotyledons. (2) The sieve-tube elements have been shortened in the course of evolution in two different ways: (*a*) by a decrease in the length of individual fusiform cambial initials, and (*b*) by the appearance of secondary septa in the sieve-tube mother cells. Despite certain observational difficulties, 3 different types of companion cells were distinguishable by their length and the presence or absence of transverse septa: (i) cells much shorter than the sieve-tube elements, occurring singly, usually in the corners, but sometimes on one side of the element; (ii) cells as long as the sieve-tube element they accompany; (iii) cells as (ii) but septate, and occurring in widely separated angiospermous families. The phloem parenchyma is very variable and cannot be treated as the xylem parenchyma in the wood. It is also shown that the length of the end walls, or the sieve plates, has shortened along with the over-all decrease in the length of the sieve-tube elements, and that no correlation exists between sieve-tube type and fibre type.

939. JOLY, A. B., and TEIXEIRA, C. Observações sôbre a anatomia da casca do guapuruvú, *Schizolobium parahyba* (Vell.) Blake. **[The bark anatomy of *S. parahyba*.]** *Boletim, Faculdade de Filosofia, Ciências e Letras, Universidade de São Paulo, São Paulo* No. 224 (*Bot.* No. 15), 1958 (81–100). 7 refs. [Port.port.e.]

812. Physical and Mechanical Properties

See also Nos. 516, 970, 1119.

940. HARRIS, J. M., and KRIPAS, S. **Notes on the physical properties of Ponderosa Pine, Monticola Pine, Western Red Cedar, and Lawson Cypress grown in New Zealand.** *For. Res. Note N.Z. For. Serv.* No. 16, 1959. pp. 24.

The properties investigated were number of rings/inch, % latewood, % heartwood, % m.c. (green), green and air-dry density, basic specific gravity, and shrinkage.

941. NOWRUSOWA [NOVRUSOVA], S. A. **[The wood of *Fraxinus coriariifolia* Scheele.]** *Izvestija Akademii Nauk Azerbajdžanskoj SSR* 1958 (4), (19–28). [Russ.?] From *abstr.* in *Holzforschung, Berlin* 13 (3), 1959 (93). [G.] P.R.

Data are given on the equilibrium m.c. and moisture absorption of the wood. The linear coefficients of swelling and shrinkage are respectively 3·3 and 0·238 radially and 12·93 and 0·30 tangentially. Density is 0·77 g./c.c. *F. coriariifolia* has the highest compression strength || and the lowest static bending strength among the Caucasian species of *Fraxinus*.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 957, 959, 966, 1071, 1091, 1180.

942. OHNUMA, K. **[Method for calculation of temperature in wood during the heating period.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (133–42). [Jap.e.e.]

Extends and simplifies the application of the differential equation for heat conduction in wood by means of graphs showing the relation of time, temperature, dimensions and distance from the surface. Two nomograms are included for practical use.

943. BAĐUN, S. Primjena radioaktivnih izotopa u tehnologii drva. **[The use of radioactive isotopes in wood technology.]** *Drvna Ind.* 10 (5/6), 1959 (86–93). 7 refs. [Croat.e.] P.R.

Summarizes research on the use of isotopes in wood technology, e.g. to determine moisture content of wood and the relationship between volume, m.c. and thickness of sample and penetrability by β- and γ-rays. Further possible uses, e.g. in determining fibre saturation point, or for sterilizing wood, are indicated.

944. PARRISH, W. B. **Attenuation of gamma rays by wood.** *Abstr. of thesis,* in *Dissert. Abstr.* 19 (7), 1959 (1876–7). O.R.S.

Various energies of radiation were absorbed in Pine, Poplar and Oak boards and the emergent beam was measured with a scintillation spectrometer. The absorption curves for each species, plotted on semi-logarithmic paper, were straight lines, indicating that the ratio of the kinds of atoms composing the wood was consistent throughout its thickness. Measurements were made of the penetrating radiations through a pile of 24 boards, and then of the pile when a space had been made by removing one or more boards from varying places in the pile; even ½-in. spaces could be detected easily by these means, and the location of a space in the pile had little to do with its resolution. A sound and a defective log were passed in a direction parallel to their diameters between a γ-ray source and the detector, and measurements made through their cross-sections at ½-in. intervals. The results, plotted on linear paper, showed that defects in logs could easily be detected by these means. Similar absorption experiments were carried out with a G.M. counter circuit. The slope of the absorption curves decreased with increasing board thickness. When the method was applied to defective logs, the defects were not resolved so well as with the spectrometer. When

a film was used to detect the penetrating radiations through a sound and a defective Oak log there was a difference in the relative exposure of the developed film between the two but the defect was not so well resolved as with the spectrometer. Values of the mass absorption coefficient (m.a.c.) decreased with increasing moisture content (m.c.) of the 3 species studied; there was less change in the values of the m.a.c. in the denser species of wood than in the less dense ones, with like changes in m.c. There was very little change in the relative intensity of penetrating radiations through wood of 0–30% m.c. because of the small change in wood density. Above 30% there was a greater change in the relative intensity in the denser than in the less dense species of wood with like changes in m.c.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 943–4, 1014, 1069, 1079–81, 1095–6, 1138.

945. BOYE, C. Træfugtighedsmålere. **[Moisture meters for wood.]** *Træindustrien* 9 (7), 1959 (86–92). 8 refs. [Dan.] P.R.

A general discussion of resistance-type moisture meters, with descriptions and a table showing technical data, prices etc. of 3 German, 1 Danish, 1 English and 3 U.S. models.

946. ATANASOVA, M., and ŠANOVA, P. Aparat za opredeljane vlažnostta na dărvesinata. **[Apparatus for determining the moisture content of wood.]** *Nauč. Trud. Lesoteh. Inst., Sofia* No. 6, 1958 (233–5). 2 refs. [Bulg.g.)

The moisture meter [see *F.A.* 20 No. 969] had an accuracy of 0·5–2% with Pine of 8·7–30% m.c., Silver Fir of 9–29% and Oak of 9–32%.

947. BROUN, M. JA., and ŠITOVA, A. E. Beskontaktnyj èlektrovlagomer. **[Electric capacity moisture meter.]** *Derev. Prom.* 8 (2), 1959 (9–10). 3 refs. [Russ.] P.R.

Describes the instrument, developed in Lvov, and gives results of tests on *Pinus sylvestris* and Carpathian Beech. [Cf. *F.A.* 16 No. 4499.]

948. ETHERIDGE, D. E. **A non-destructive method of estimating moisture in wood.** *Repr.* from *Canad. J. Bot.* 37 (3), 1959 (491–2).

In the method described, cylindrical probes, 1–1½ in. long, prepared from air-dry ¼-in. White Birch dowelling, were inserted in small bore-holes in the wood to be tested; after equilibrium between the probes and samples had been reached (8 days for m.c. in the range 30–80% of the oven-dry weight, and 24 hours for the range 6–30%), the probes were removed and weighed and the % of water present was assumed to be equal to that in the sample. The efficacy of the method was not reduced when the samples and the probes differed in density. It was possible to estimate with reasonable accuracy the m.c. of samples of Lodgepole Pine (sp. gr. 0·47) and Aspen (0·34), using probes of Birch (0·55). The technique was developed for use in living trees, in connexion with a study on the influence of branch moisture content on the process of infection by fungi in living Aspen, but other potential uses are discussed.

949. YAMADA, T., and KADITA, S. **Adsorption of water vapour on wood (1).** *Transl. For. Prod. Lab. Can.* No. 130, 1959. pp. 21. Transl. from *Wood Res., Kyoto* No. 9, 1952 (42–62). [See *F.A.* 16 No. 893.] Limited distribution.

950. KOLLMANN, F. Über die Sorption von Holz und ihre exakte Bestimmung. **[Sorption in wood, and its exact determination.]** *Holz Roh- u. Werkstoff* 17 (5), 1959 (165–71). 29 refs. [G.g.e.] P.R.

Distinguishes between chemisorption, unimolecular sorption, multimolecular sorption, and capillary condensation, and discusses a quantitative delimitation of sorption phenomena, and the influence of temperature and hysteresis. Exact sorption measurements are extremely difficult, but measurement in a vacuum is proving useful. The value of a piece of apparatus developed at Munich [see *F.A.* 20 No. 2286] is discussed. This features extreme temperature constancy, and allows exact measurements even very close to the fibre saturation point. The phenomenon of hysteresis was not influenced by measurement in a high vacuum. *From author's summary.*

951. MALMQUIST, L. Die Wasserdampfsorption des Holzes vom Standpunkt einer neuen Sorptionstheorie. **[Sorption of water vapour by wood from the standpoint of a new sorption theory.]** *Holz Roh- u. Werkstoff* 17 (5), 1959 (171–8). 5 refs. [G.g.e.] P.R.

Detailed application of the space theory of sorption to the results of sorption measurements on *Araucaria klinkii* wood has shown that the general isotherm of this theory describes the values within the range of experimental error. Moreover, there is strong evidence of the presence of compound sorption with liquid sorption in one part of the structure, and of soft sorption in another part. The theory makes possible a quantitative description and a physical explanation of sorption hysteresis. The hysteresis structure of wood, as required by the theory, and the conclusions drawn from this on future research, are discussed. [Cf. *F.A.* 18 No. 4546.] *From author's summary.*

952. CHRISTENSEN, G. N., and KELSEY, K. E. Die Geschwindigkeit der Wasserdampfsorption durch Holz. **[The rate of sorption of water vapour by wood.]** *Holz Roh- u. Werkstoff* 17 (5), 1959 (178–88). 20 refs. [G.g.e.] P.R.

Studies were made on the rate of sorption (r.s.) of water vapour in the absence of air, on small samples of *Araucaria klinkii* [cf. *F.A.* 18 No. 4546; 20 No. 5114]. The samples were 20 × 10 × 1 mm. with the 1-mm. dimension (*a*) in the fibre direction, (*b*) in the tangential direction, and the third sample consisted of longitudinal pieces 20μ thick. R.s. decreased at increasing relative vapour pressure, indicating that diffusion of water in wood was not the factor controlling r.s. The equilibrium m.c. was also found to be independent of sample shape

up to a relative vapour pressure of 0·75, indicating that sorption was not limited by morphological restraints to swelling. The rate of dissipation of the heat liberated in the initial stages of sorption was considerably greater than the rate of approach to sorption equilibrium, except when sorption commenced from the dry state. The r.s. values between different initial and final relative vapour pressures were compared systematically, and showed that r.s. could be predicted approximately by an expression. When sorption commenced from the dry state, the rate of approach to sorption equilibrium was independent of the final vapour pressure chosen. A method is presented for ascertaining theoretically the sorption isotherm that would be obtained from a succession of infinitely small steps of m.c. increment, and a possible mechanism of the sorption process based on stress relaxation within the swelling gel is discussed. *From authors' summary.*

953. CHRISTENSEN, G. N., and KELSEY, K. E. Die Sorption von Wasserdampf durch die chemischen Bestandteile des Holzes. [**The sorption of water vapour by the chemical constituents of wood.**] *Holz Roh- u. Werkstoff* 17 (5), 1959 (189–203). 31 refs. [G.g.e.] P.R.

Essentially the same as material already reported [see *F.A.* 20 No. 5114]. It is further concluded that, during the sorption of water, lignin behaves (like wood and cellulose) as a swelling gel, and that the sorption of water by wood may be considered approximately as the additive result of the sorption by its major components. *From authors' summary.*

954. STAMM, A. J. Verfahren zur Abschätzung der Wasserdampfsorption am Fasersättigungspunkt von Holz und Papier. [**A method of estimating water vapour sorption at the fibre saturation point of wood and paper.**] *Holz Roh- u. Werkstoff* 17 (5), 1959 (203–5). 6 refs. [G.g.e.] P.R.

If the fibre saturation point (f.s.p.) of wood or paper is defined as the moisture content occurring when the cell-walls are saturated and no free water exists in the microscopically visible capillary structure, the f.s.p. can be shown to occur between 99 and 99·9% r.h. Sorption isotherms for paper, and probably for wood also, can be extended to almost 100% r.h., if measurements of swelling (as well as sorption measurements) are made at different levels of r.h., and if the swelling of wood kept in water is also investigated. The sorption corresponding to the f.s.p. can be calculated by multiplying the swelling in water and the mean value of the sorption/swelling ratio at different levels of r.h., in cases in which the relation of sorption to swelling shows only trifling differences for different levels of r.h. *Author's summary.*

955. NOACK, D. Beitrag zur Sorption des Holzes im Bereich höherer Temperaturen und Wasserdampfdrücke. [**Sorption of wood at elevated temperatures and water vapour pressures.**] *Holz Roh- u. Werkstoff* 17 (5), 1959 (205–12). 17 refs. [G.g.e.] P.R.

In connexion with the heat treatment of wood, knowledge of the equilibrium m.c. at elevated temperatures (100–130° C.) and water vapour pressures (0·9–2·75 kg./sq. cm.) is of great importance, as extrapolations of hygroscopic isotherms for temperatures < 100° differ widely for these elevated temperatures and pressures. Sorption tests at such temperatures are also complicated by irreversible processes of decomposition. An experimental apparatus for sorption investigations was designed (illustrated and described), which works on the principle of direct manometer measurement of the gas pressure in the sorption space, and volumetric measurement of the moisture sorbed by the wood. The e.m.c.'s obtained in preliminary tests were, without exception, a few percent in m.c. above the values obtained by extrapolation. *From author's summary.*

956. HARTWIG, G. L. F. **The equilibrium moisture content of wood—Parts 1 & 2.** *Timb. Technol.* 67 (2241; 2242), 1959 (284–6; 323, 325–7). 8 refs.

Quarter-sawn and flat-sawn, and planed and unplaned planks of 3 Eucalypt and 2 Pine species were stacked for one year in racks (*a*) indoors, (*b*) out of doors under cover, and (*c*) out of doors exposed (upright or flat), at Stellenbosch, S. Africa. The ends of all planks were given two coats of aluminium paint. It was found that the mean e.m.c. of the Pines (11·46–11·76%) differed only slightly from that of the Eucalypts (12·09–12·48%) as registered in (*a*) over 1 year. Therefore, for use (*a*) in places with similar climate, the wood should be seasoned to ca. 12% m.c.; for use (*b*) to ca. 14% m.c. For use (*c*) upright, Eucalypts should be seasoned to ca. 15% and Pine to ca. 19% m.c.; for (*c*) flat, the values are 13 and 18% respectively. Quarter-sawn Pine had a higher e.m.c. than flat-sawn, but with Eucalypts the position was reversed, though the differences were too small to justify separate m.c. specifications for flat- and quarter-sawn wood. No significant variation in e.m.c. was found between planed and unplaned timber. The e.m.c. of the species studied was conditioned by the r.h. of the preceding 14 days.

957. NAKATO, K. [**On the cause of the anisotropic shrinkage and swelling of wood, XIV, XV. On the relationships between the dielectric properties and the anisotropic shrinkage (1), (2).**] *Sci. Rep. Saikyo Univ. (Agric.), Kyoto* No. 10, 1958 (37–54). 38 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 20 No. 5124.] (1) Presents the results of experiments on the dielectric constant, radially and tangentially, of 5 softwood and 2 hardwood species, and the dielectric constant and loss of *Larix leptolepis* in relation to frequency and the calculated values for isolated early and late wood. (2) Presents results showing the relation of dielectric constant and loss to shrinkage of *Cryptomeria japonica, Abies firma* and *Larix leptolepis*, concluding that the main cause of anisotropic shrinkage in the transverse section of early and late wood of conifers is probably related to the cell-wall structure, in particular the distribution and spin-axis direction of active hydroxyl groups. *From author's summaries.*

958. KÜBLER, H. **Studies on the movement of moisture through wood.** *Transl. For. Prod. Lab. Can.*

No. 120, 1958. pp. 36. 69 refs. Transl. from *Holz Roh- u. Werkstoff* 15 (11), 1957 (453–68). [See *F.A.* 20 No. 2295.] Limited distribution.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 570, 861, 944, 1013, 1014.

959. CAMERON, J. F., BERRY, P. F., and PHILLIPS, E.W. **The determination of wood density using beta rays.** *Holzforschung, Berlin* 13 (3), 1959 (78–84). 6 refs. [E.e.g.] P.R.

Investigations are described leading to the development of a semi-micro method of density determination in which a radial strip of wood prepared from an increment core was scanned in 0·5-mm. steps by a collimated beam of β-rays from a Sr + Yt source. In this way the variation in density across individual growth rings of Douglas Fir was observed. Tedious and difficult gravimetric density determinations gave results within 2·5% of those from the β-ray determinations. Fundamental considerations underlying the method are discussed, possible sources of error examined, and further refinements suggested. [Cf. *F.A.* 20 No. 984.]

960. WAHLGREN, H. E., and FASSNACHT, D. L. **Estimating tree specific gravity from a single increment core.** *Rep. U.S. For. Prod. Lab., Madison* No. 2146, 1959. pp. 9 + 3 photos., 7 gphs., 4 tbls., 1 sketchmap. 6 refs.

[Cf. *F.A.* 20 No. 938.] Describes tests made to determine how increment-core sp. gr. at b.h. correlates with that of cross-sections at successive heights throughout the merchantable volume of Southern Pines. Pulpwood bolts ca. 5·4 ft. long were cut progressively from base to a min. top diam. of 3 in. from 100 trees each of Longleaf, Slash, Loblolly and Shortleaf Pines (diam. range 5–16 in.), and complete cross-sections, 1–2 in. thick, were cut from the trees between each two consecutive bolts. The d.b.h. was measured, an increment core extracted at this position, and the length from bark to pith measured to within 0·01 in. Computations made for the mean sp. gr. of each bolt are described and simple regression equations are given for estimating sp. gr. Progressive decrease in sp. gr. with increasing height was confirmed, and significant relationships of increment-core sp. gr. at b.h. to the mean sp. gr. of the stem were found. Further work is needed (*a*) to develop optimum mensurational procedures for non-destructive determination of b.h. segments of tree boles, and (*b*) on sampling of Southern Yellow Pine forests to establish relationships between core-sample and tree sp. gr. for the full range of site, age, diameter and sp. gr.

961. GUIHER, J. K., PETERSON, K. R., and WALTERS, C. S. **The specific gravity of Illinois-grown Red Oak.** *For. Note Ill. Agric. Exp. Sta.* No. 85, 1959. pp. 3.

The average sp. gr. for Red Oaks (*Quercus velutina, Q. rubra, Q. falcata, Q. coccinea, Q. palustris, Q. falcata* var. *pagodaefolia* and *Q. phellos*) grown in Illinois compared favourably with that for the group in the whole of its natural range.

962. PETERSON, K. R., GUIHER, J. K., and WALTERS, C. S. **The specific gravity of Eastern Cottonwood [*Populus deltoides*] grown in Illinois.** *For. Note Ill. Agric. Exp. Sta.* No. 86, 1959. pp. 2. 1 ref.

The average sp. gr. for *P. deltoides* grown in Illinois was the same as that throughout its natural range.

812.7. Strength Properties

See also Nos. 920, 1014, 1037, 1072, 1105.

963. HRULEV, V. M. O metodah ispytanij fiziko-mehaničeskih svojstv fanery. **[Methods of testing the physical and mechanical properties of plywood.]** *Derev. Prom.* 7 (12), 1958 (12–4). [Russ.] P.R.

Describes the testing methods used in Soviet Standard GOST 1143–41 to determine the modulus of elasticity of 3-, 5- and 7-ply sheets of Birch veneers 4, 7 and 10 mm. thick respectively [cf. *F.A.* 20 No. 1065]. Compression, shear and bending tests were carried out along, across, and diagonally to the sheets, the results being presented in tabular form. Brief comparisons are made with methods used in Swedish and American standards.

964. YLINEN, A. Über den Einfluss der Verformungsgeschwindigkeit auf die Bruchfestigkeit des Holzes. **[The influence of the rate of deformation on the ultimate strength of wood.]** *Holz Roh- u. Werkstoff* 17 (6), 1959 (231–4). 13 refs. [G.g.e.] P.R.

[Cf. *F.A.* 20 No. 2302.] By combining the differential equation arrived at by Maxwell in his relaxation theory, and the equation in St. Venant's rupture hypothesis, a formula was obtained showing how the ultimate strength depends on the rate of deformation. The theoretical results agree well with Norén's test measurements [see *F.A.* 16 No. 3380].

965. **Factors influencing the strength properties of wood: temperature.** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1958*, 1959 (12).

Results of tests on Douglas Fir, Ash and Balsam at −190° and −75°C. in a special double-walled testing chamber indicate very appreciable increases in strength properties as the temperature decreases. The increase is greatest in compression strength, rather less in bending, and least in shear strength.

966. **Physics: vibration methods.** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1958*, 1959 (44–5).

Describes modifications in the laboratory technique for detecting vibration response in wooden specimens, and discusses the correction of vibration measurements for the occurrence of shear and the correlation between the dynamic and static modulus of elasticity.

967. YAMAI, R. **[Studies on the orthotropic properties of wood in compression.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 113, 1959 (57–110 + 20 photos). 21 refs. [Jap.e.*e.*]

Reports in detail the results of a study to determine the elastic constants and the stress–strain relations of 11 important Japanese species, to classify the types of stress–strain curves of specimens in compression,

and to examine the effect of grain angle on elastic constants and stresses at proportional limit in compression. The data are set out in 24 sets of graphs and 52 tables (all with English legends). The species tested were *Cryptomeria japonica, Abies sachalinensis, Picea jezoensis, Pinus densiflora, Fagus crenata, Dipterocarpus* sp., *Betula maximowicziana, Quercus gilva, Q. crispula, Fraxinus mandshurica* and *Zelkova serrata.*

968. NARAYANAMURTI, D., GUPTA, R. C., and NARAYANAMURTI, V. **Influence of loading on the rigidity modulus and plastic flow of wood.** *Applied Scientific Research, The Hague* 7*A* (2/3), 1958 (145–8). 4 refs. [E.] L.S.

Selected veneers (0·25 or 0·4 × 12·7 × 127 mm.) of 13 species (hardwoods and softwoods) were tested in a torsion pendulum apparatus after wetting. Torsional modulus of rigidity increased (not proportionally) with increased time of loading except for *Pinus longifolia*, the greatest increase being observed in *Terminalia bialata.* The increase was generally greater in sap- than in heartwood, and in specimens moistened with an extract of the same wood than in specimens moistened with distilled water (i.e. leached).

969. **Rheological studies.** *Extr.* from *Rep. For. Prod. Aust. 1958/59*, 1959 (12–3).

[Cf. *F.A.* 20 No. 2303.] Tests designed to detect directly any departure from linearity in the relationship between creep rate and applied stress below the discontinuity that occurs at ca. 67% of ultimate strength have confirmed that the relation is very closely linear. *Eucalyptus pilularis* has proved generally similar in creep behaviour to *E. regnans* over the full range of stress from zero to failure. A study of the activation energy of the process shows no change at the point of discontinuity, so that the discontinuity is presumably an entropic phenomenon involving molecular chain strengthening in the amorphous region at and above this stress. Moisture increase and decrease whilst under load both cause increase in creep rate. In 2 years, beams of *E. regnans* have been found to creep twice as much at 45° as at 20° C. At the higher temperature most of the creep took place in the first year, whereas at the lower the creep rate was still quite appreciable after 2 years, so that the ultimate ratio will be somewhat less than 2.

970. HARRIS, J. M., and ORMAN, H. R. **The physical and mechanical properties of New Zealand grown Douglas Fir (*Pseudotsuga taxifolia* Britt.).** *Tech. Pap. For. Res. Inst. N.Z. For. Serv.* No. 24, 1958. pp. 87 + 5 photos. 3 refs.

Twenty-four trees from 11 contrasted sites were tested for their physical properties. Results indicate that, within the range of sites represented, age of tree and rate of growth are the most important factors regulating wood density. The air-dry density of individual trees varied from 24 lb./cu. ft. for a 25-year tree grown at 3 rings per in. to 35 lb./cu. ft. for a 46-year tree grown at ca. 9 rings per in. Analyses are presented of the variation of wood density with age, rate of growth and % of latewood. Results of strength tests on 12 trees and some 30 flitches from 4 contrasted sites indicate that Douglas Fir grown in New Zealand is as dense and as strong as virgin and second-growth material grown on the west coast of North America. It is recommended that timber averaging < 5 rings per in. be excluded from the superior grades of structural timber. *From authors' summary.*

971. PEJOSKI, B. Mehaničkite svojstva na drvoto od divata i pitomata foja. **[Mechanical properties of the wood of *Juniperus excelsa* and *J. foetidissima.*]** *God. Zborn. Zemj.-Šum. Fak. Univ. Skopje* (*Šum.*) No. 11, 1957/1958 (131–48). 3 refs. [Maced.f.*f.*]

Results of tests using both Jugoslavian and French standards are shown. The samples, of 12% moisture content, were from 4 trees of each species.

972. SEKHAR, A. C., and SHARMA, R. S. **A note on mechanical properties of *Taxus baccata.*** *Indian For.* 85 (6), 1959 (324–6 + 1 dgm., 1 tbl.). 2 refs.

Samples were tested from 9 trees growing at 10,000 ft. alt. in the Punjab and from 10 trees at 8000–9000 ft. in W. Bengal. Data are tabulated. Strength properties of the Yew were close to those of Indian-grown Teak, and that grown at lower elevations was superior to that grown at higher.

973. SAMORZEWSKI, J. Wytrzymałość na rozciąganie w poprzek włókien, ścinanie wdłuż włókien oraz udarność i twardość krajowego drewna bukowego. **[The tensile strength ⊥, shear ||, impact strength and hardness of Polish Beech.]** *Sylwan* 103 (6/7), 1959 (151–70). [Pol.]

Continues earlier work [see *F.A.* 20 No. 958].

974. SOBCZAK, K. S. Wpływ sezonowania i parowania uplastyczniającego na trwała zmianę niektórych mechanicznych i fizycznych własności drewna bukowego. **[The influence of seasoning and plasticizing steaming on lasting changes in mechanical and physical properties of Beech wood.]** *Sylwan* 103 (4), 1959 (5–23). 10 refs. [Pol.pol.russ.e.]

Tests were made at monthly intervals for 7 months on specimens subjected to air drying, with or without an hour's steaming at 1½ atm. pressure, before each test. Air drying alone had no effect on strength in tension and compression. Results of other tests were inconclusive. Steaming did not affect strength in tension || or impact strength. It caused a lowering of strength in compression || in wood that had been dried > 5 months (m.c. ca. 15%), and of modulus of elasticity in wood of > 20% m.c. that had been dried < 6 months. The darkening caused by steaming decreased with m.c., and ceased at < 20% m.c. It is concluded that seasoning does not affect the usefulness of wood for bending, and that changes in strength (apart from elasticity) caused by steaming are not of practical importance.

813. Wood Chemistry

See also Nos. 69, 73, 905, 1011, 1013, 1184.

975. **Proceedings of the Fourth International Congress of Biochemistry, Vienna, 1–6 September 1958. Vol. II. Symposium II: Biochemistry of wood.** Pergamon Press, London, New York, Paris. 1959.

pp. xi + 285 + many plates. [E., F. or G.] O.R.S.

Contains the following papers, mostly of a review type, but including some reports on individual research, with many references, and discussion: Conifer chemistry and taxonomy of conifers (*H. Erdtman*; [E.]); The biogenesis of terpenes and terpenoids (*W. Sandermann*; [G.]); Terpene formation in Pine (*R. G. Stanley*; [E.]) [cf. *F.A.* 20 No. 115]; The biosynthesis of anthocyanins (*H. Griesbach*; [G.]); The physiological relationship of lignin and flavonoid formation (*H. Reznik*; [G.]) [illustrated by photomicrographs showing the presence of labelled substances in different parts of the plant after their introduction into young Spruce [cf. *F.A.* 18 No. 1325] and tabulated results of experiments with various deciduous and coniferous species and some agricultural crop plants]; On the enzymic polysaccharide synthesis [: experiments with *Acetobacter xylinum*] (*G. A. Greathouse*; [E]); Biosynthesis of hemicelluloses (*A. C. Neish*; [E.]); The process of lignification in woody plants (*A. B. Wardrop* and *D. E. Bland*; [E.]); The absorption of preservatives by different Pines and comparison between absorption by the early and late wood (*J. Guillemain-Gouvernel*; [F.]) [absorption was significantly higher in the late than in the early wood of *Pinus sylvestris* [cf. *F.A.* 19 No. 4906], whereas there was no significant difference in *P. halepensis*; absorption of PCP was significantly higher with a polar solvent; these results are related to the difference in the number and distribution of bordered pits and resin canals between early and late wood in the two species]; Biochemical processes in wood formation (*K. Freudenberg*; [G.]); Quinoid structures and benzylalcohol groupings in the chemistry and biochemistry of lignin (*E. Adler*; [G.]); The oxidation condition of the side chains in native lignin (*M. J. Marton*; [G.]); Studies on the biosynthesis of lignin (*T. Higuchi*; [E.]) [comprises a report on original work and a review]; Lignification (*F. F. Nord* and *W. J. Schubert*; [E.]); The isolation and determination of active fractions (phenylpropanes) of lignin after the uptake of labelled compounds (*G. Billek*; [G.]); The phylogenesis of lignin (*S. M. Manskaja*; [G.]); The biochemical formation of humus substances from lignin (*W. Flaig*; [G.]); and The biochemistry of wood: a report on Symposium II (*K. Kratzl*; [G.]).

976. Babicki, R., and Prosiński, S. Z badań nad chemicznym składem drewna buka nizinnego. **[Tests on the chemical composition of lowland Beech.]** *Sylwan* 103 (5), 1959 (101–8). 22 refs. [Pol.]

Tabulates the moisture content and, in % of air-dry weight of wood, the amounts of hot-water extractives, alcohol and benzene extractives, cellulose, lignin, furfural, pentose, pentosans, and ash, from samples taken at heights of 1·3, 5 and 12 m. from (*a*) 4 trees from the middle, and (*b*) 4 trees from the edge of a stand. In (*a*), cellulose contents at 1·3 m. were 41·68–42·32%, at 5 m. 43–44·1%, and at 12 m. 41·02–43·41%; in (*b*) 41·98–43·08%, 43·38–43·93% and 42·45–43·74% respectively. The range of lignin contents in samples from (*a*) was 18·91–22·31; in samples from (*b*) 19·93–22·9%. The range of contents of pentosans in (*a*) was 23·25–26·26%; in (*b*) 23·72–25·89%. There were only slight variations in ash content at the different sampling heights, and differences between (*a*) and (*b*) were also slight.

813.1. Chief Organic Constituents. Constituents of the Cell Wall

See also Nos. 923, 953, 1064, 1111, 1120.

977. Frey, H. P. Über die Einlagerung des Lignins in der Zellwand. **[The lignification of the cell-wall.]** *Holz Roh- u. Werkstoff* 17 (8), 1959 (313–8). 26 refs. [G.g.e.] P.R.

Lignification was studied by optical methods in *Picea abies*. By determining the modulus of extinction of the lignin in ultraviolet light it was possible to measure the lignin content in microsections. It was found that the lignin was more evenly distributed over the cell-wall than had been supposed. The lignified cell-wall showed slight dichroism in ultraviolet light, attributed to the effect of the cellulose texture rather than to natural dichroism of the lignin; this suggests that there is no orientation of the lignin.

978. Schubert, W. J., and Acerbo, S. N. **The conversion of *d*-glucose into lignin in Norway Spruce. A preliminary report.** *Arch. Biochem.* 83 (1), 1959 (178–82). 14 refs. O.R.S.

979. Wardrop, A. B., and Davies, G. W. **Lignification in model systems.** *Holzforschung, Berlin* 13 (3), 1959 (65–70). 23 refs. [E.e.g.] P.R.

A study of the nature of artificial lignification taking place in materials including *Pinus radiata*, *Eucalyptus regnans* and *Tilia americana* in a solution of eugenol/H_2O_2/phosphate buffer. Artificial lignification proceeded in the xylem, phloem and cambium zones, and could be followed by the increasing ultra-violet absorption of these tissues. The cambium, however, gave no staining reaction with phloroglucinol/HCl, so that here the reaction product differed from that in the xylem and phloem. This is probably due to the high reducing capacity of the cambium. From the staining reactions and the structure of artificial lignin as observed by electron microscope, it was concluded that the artificial lignin is deposited between the cellulose microfibrils of the cell-wall. *From authors' summary.*

980. Higuchi, T. **Studies on the chemical properties of the lignin of Bamboo-stalk.** *Journal of Biochemistry, Tokyo* 45 (9), 1958 (675–85). 19 refs. [E.] O.R.S.

It is concluded from ethanolysis and hydrolysis of stalks of *Phyllostachys edulis* that the lignin is, at least in part, formed by oxidative condensation of β-guaiacyl ethers of guaiacyl-, syringyl-, and *p*-hydroxyphenyl-propanes. [Cf. *F.A.* 19 No. 4795.]

981. Freudenberg, K., and Niedercorn, F. Anwendung radioaktiver Isotope bei der Erforschung des Lignins, VIII. Umwandlung des Phenylalanins in Coniferin und Fichtenlignin. **[Use of radioactive isotopes in lignin research, VIII. Conver-**

sion of phenylalanine to coniferin and Spruce lignin.] *Chem. Ber.* 91 (3), 1958 (591–7). 15 refs. [G.g]. O.R.S.

When phenylalanine[$C_6H_5CH_2.C^{14}H(NH_2).COOH$] was introduced into young Spruce stems, radioactive coniferin was isolated above the point of entry after 2–3 days, indicating that coniferin is the transition stage of Spruce lignin. Coniferin was also found, in addition to syringin, in the cambial area of *Syringa* sp. *From authors' summary.*

982. BROWN, S. A., and NEISH, A. C. **Studies of lignin biosynthesis using isotopic carbon. VIII. Isolation of radioactive hydrogenolysis products of lignin.** *J. Amer. Chem. Soc.* 81 (10), 1959 (2419–24). 21 refs. O.R.S.

[Cf. *F.A.* 17 No. 1971.] Several C^{14}-labelled compounds were administered to cut ends of stems of wheat and twigs of *Acer negundo* var. *interius* and the hydrogenolysis products, dihydroconiferyl and dihydrosinapyl alcohols, were isolated. Their radioactivity was used to judge the degree of incorporation of the administered compounds into the lignin.

983. BLAND, D. E., *et al.* **The behaviour of lignin during high temperature alcohol treatment without mineral acid catalyst.** *Repr.* from *Holzforschung, Berlin* 13 (1), 1959 (6–8). 10 refs. [E.e.g.]

Ethanol lignin was prepared by treating benzene/ethanol extracted Spruce wood (*Picea abies*) with ethanol at 150° C. for 8 hr., and again for 8 hr. with fresh ethanol, the degree of alkylation after treatment being accurately determined by a gas-chromatographic alkoxyl analysis. The methanol treatment of wood was investigated with methanol-C^{14}. The introduced alkoxyl groups can be partly split off by mild alkali/acid hydrolysis. The model substance β-guaiacyl ether of guaiacyl glycerol showed similar properties. When the radioactive lignin was demethylated by the Zeisel method, only a part of the activity was recovered in the MeI, and it is concluded that the methanol entered the lignin partly with the formation of a stable C–C bond.

984. PEPPER, J. M., BAYLIS, P. E. T., and ADLER, E. **The isolation and properties of lignins obtained by the acidolysis of Spruce [*Picea abies*] and Aspen [*Populus tremuloides*] woods in dioxane-water medium.** *Canad. J. Chem.* 37 (8), 1959 (1241–8). 15 refs. O.R.S.

985. BHATTACHARYA, A., SONDHEIMER, E., and SCHUERCH, C. **Lignin from the alkaline hydrogenation of Sugar Maple wood. II. The acidic and water soluble fractions.** *Tappi* 42 (6), 1959 (446–8). 16 refs. P.R.

Six acids isolated from this lignin were identified as *p*-hydroxybenzoic, vanillic, syringic, guaiacylacetic, guaiacylpropionic and syringylpropionic acids. Catechol or pyrogallol derivatives, presumably formed by demethylation of guaiacol or syringyl residues, may be present in the liquor.

986. LEWIN, M., and EPSTEIN, J. A. **Effect of time and temperature on the direct nitration of *Eucalyptus rostrata*.** *Tappi* 42 (7), 1959 (549–52). 16 refs. P.R.

Describes tests in which *E. rostrata* samples were nitrated for various intervals from ½ to 1000 hours at 3° C., and discusses the value of direct nitration as an analytical tool for determining α-cellulose, the degree of polymerization of the cellulose and its distribution. The results are compared with those obtained previously for nitration at 20° C., and are further interpreted in terms of the α-cellulose/hemicellulose bond which was postulated for this wood. [Cf. *F.A.* 20 No. 2334.]

987. WHISTLER, R. L., and SANNELLA, L. J. **Hemicelluloses.** In *Proceedings of the Fourth International Congress of Biochemistry, Vienna 1958.* Pergamon Press, London, New York, Paris. Vol. 1, 1959. pp. 1–14. 95 refs. O.R.S.

A review, including recent data on wood hemicelluloses.

988. TIMELL, T. E. **The constitution of a hemicellulose from Sugar Maple (*Acer saccharum*).** *Canad. J. Chem.* 37 (5), 1959 (893–8). 35 refs. O.R.S.

Lists the constituents obtained from partial hydrolysis of the main hemicellulose constituent of *A. saccharum* and from hydrolysis of the fully methylated polysaccharide and gives the degree of polymerization of the native and methylated polysaccharide. The structure of the polysaccharide is similar to that of the main hemicellulose component of Beech [see *F.A.* 16 No. 931], White Birch [see *F.A.* 20 No. 1009] and Yellow Birch.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also Nos. 917, 934, 1117, 1195, 1201, 1208.

989. BUCHANAN, M. A., SINNETT, R. V., and JAPPE, J. A. **The fatty acids of some American pulpwoods.** *Tappi* 42 (7), 1959 (578–82). 23 refs. P.R.

Seven Pine and two hardwood species were examined, paper chromatography indicating that the fatty-acid components of the Pines comprised mainly oleic and linoleic acids, and that smaller amounts of linolenic, palmitic, stearic, and lignoceric acids were present. Linoleic acid was predominant in Aspen and Birch, with smaller amounts of oleic, linolenic, and the even-numbered saturated acids from palmitic through lignoceric acid. Most of the fatty-acid content in all species was present as triglycerides, but some free acids were present, and and in some cases part of the fatty acids appeared to be esterified with other alcohols. From 80 to 90% of the total sterols were in a combined form, possibly as fatty-acid esters. *From authors' summary.*

990. KOHLBRENNER, P. J., and SCHUERCH, C. **Benzene-alcohol soluble extractives of Sitka Spruce.** *J. organ. Chem.* 24 (2), 1959 (166–72). 24 refs. O.R.S.

991. ENZELL, C., and ERDTMAN, H. **The chemistry of the natural order of Cupressales—XXI. Cuparene and cuparenic acid, two sesquiterpenic**

compounds with a new carbon skeleton. *Tetrahedron, Lond.* 4 (3/4), 1958 (361–8). 13 refs. [E.e.] O.R.S.

An aromatic sesquiterpene, cuparene, has been isolated from *Chamaecyparis thyoides*, *Thuja orientalis* and *Widdringtonia* spp. Oxidation with dilute HNO_3 gives terephthalic acid, prolonged treatment with O_3 gives (+)—camphonanic acid, and oxidation with CrO_3, cuparenic acid; this acid was found to be identical with a sesquiterpene acid previously isolated from *Widdringtonia* spp. and *C. thyoides*. *From authors' summary.*

992. BRIGGS, L. H., and CAIN, B. F. **Chemistry of the Podocarpaceae—I. Constituents of the heartwood of *Podocarpus spicatus*.** *Tetrahedron, Lond.* 6 (2), 1959 (143–4). 8 refs. [E.e.] O.R.S.

Quercetin, and a new *iso*flavone, podospicatin, have been isolated.

993. BRIGGS, L. H., and CEBALO, T. P. **Chemistry of the Podocarpaceae—II. The isolation of genistein from *Podocarpus spicatus* [heartwood] and the constitution of podospicatin.** *Tetrahedron, Lond.* 6 (2), 1959 (145–7). 9 refs. [E.e.] O.R.S.

994. BRIGGS, L. H., CAMBIE, R. C., and HOARE, J. L. ***seco-iso*Lariciresinol, a new lignan from [heartwood of] *Podocarpus spicatus*.** *Tetrahedron Letters, London* 1959 (4), (14–5). 3 refs. [E.] O.R.S.

995. PEARL, I. A., BEYER, D. L., and LASKOWSKI, D. **Glucosides of vanillic and syringic acids in deciduous woods.** *J. organ. Chem.* 24 (3), 1959 (443). O.R.S.

Data (to be published in detail elsewhere) on the extractives of 46 representative hardwoods suggest that all hardwoods contain glucosides of vanillic and syringic acids.

996. CAMBIE, R. C. **Wood extractives of *Aristotelia serrata*.** *N.Z. J. Sci.* 2 (2), 1959 (257–9). 4 refs.

β-Sitosterol, β-sitosteryl-*d*-glucoside and ellagic acid have been isolated from the wood. *From author's summary.*

997. PRISTA, L. NOGUEIRA, and ALVES, A. CORREIA. Contribuição para o estudo químico do lenho de *Artocarpus integrifolia*. [**Chemistry of the wood of *A. integrifolia*.**] *Garcia de Orta, Lisboa* 6 (4), 1958 (679–88). 37 refs. [Port.f.e.]

An extractive was isolated from the wood, having characteristics similar to that of cycloartenone obtained from the fruits. The characteristics are also described of two flavonoids obtained by fractionation of ether and alcohol extracts of the wood.

998. PACHÉCO, H. Sur les composés flavoniques du cœur de *Prunus mahaleb*. [**Flavonic compounds in the heartwood of *P. mahaleb*.**] *Bull. Soc. Chim. France* 1958 (5), (582). [F.] O.R.S.

Aramodendrine, naringenine, prunetine, and genisteine were isolated.

999. PACHÉCO, H. Sur la présence d'hétérosides de flavanonols dans l'aubier de différents *Prunus*. [**The presence of heterosides of flavanonols in sapwood of various *Prunus* spp. [*P. avium, P. mahaleb* and *P. armeniaca vulgaris*].**] *C.R. Acad. Sci., Paris* 248 (18), 1959 (2636–7). [F.f.]. O.R.S

1000. HASEGAWA, M. **Flavonoids of various *Prunus* species. VIII. The flavonoids in the wood of *Prunus mume*.** *J. organ. Chem.* 24 (3), 1959 (408–9). 10 refs. [Cf. *F.A.* 18 No. 4589.] O.R.S.

1001. GOEL, R. N., and SESHADRI, T. R. **Padmatin, a new component of the heartwood of *Prunus puddum*.** *Tetrahedron, Lond.* 5 (1), 1959 (91–3). 9 refs. as footnotes. O.R.S.

1002. HATHWAY, D. E., and SEAKINS, J. W. T. **The occurrence of hydroxystilbenes in *Eucalyptus*.** *Biochem. J.* 72 (3), 1959 (37*P*). 3 refs. O.R.S.

A preliminary study on the taxonomic significance of the presence of hydroxystilbenes showed that 3:5:4′-trihydroxystilbene, its 3-β-*D*-glucoside, and a third hydroxystilbene which is a minor constituent of *E. wandoo*, were present in 5 out of 6 heartwoods examined from the subsection *Longiores* of the *Macrantherae*. They were present in *E. calophylla*, *E. corymbosa* and *E. maculata* (*Corymbosa-Peltatae* series) and in *E. astringens* (*Cornutae*) and *E. wandoo* (*Subcornutae*) but absent from *E. saligna* (*Transversae*). *E. sideroxylon* of the section *Terminales* does not contain hydroxystilbenes.

1003. HATHWAY, D. E., and SEAKINS, J. W. T. **Hydroxystilbenes of *Eucalyptus wandoo*.** *Biochem. J.* 72 (3), 1959 (369–74). 44 refs. O.R.S.

Two hydroxystilbenes, identified as 3:5:4′-trihydroxystilbene and its 3-β-*D*-glucoside, were isolated by chromatography from the ether-soluble extractives of the heartwood, where they are embedded in ether-insoluble membrane substances. The translocation, function and ontogenesis of the 3:5:4′-trihydroxystilbenes are discussed.

1004. CAPITÒ, L., and PANIZZI, L. Ricerche sui componenti del legno di *Eucalyptus camaldulensis*. [**The chemical constituents of *E. rostrata* wood.**] *Cellulosa e Carta* 10 (8), 1959 (15). 3 refs. [It.]

Briefly describes the results of a study of heartwood of 8-year-old *E. rostrata* grown in Italy, which is reported more fully in *Annali di Chimica Applicata* 49, 1959 (771). Among the constituents identified were: *d*-catechin; gallic, ellagic and protocatechic acids; cyanidin and delphinidin; and some colourless substances of leucoanthocyanidin type.

1005. BOYER, J. P., *et al.* **Extractives of Australian timbers. II. Emmolic acid, a new triterpene acid from *Emmenospermum alphitonioides* F. Muell.** *Aust. J. Chem.* 11 (2), 1958 (236–45). 4 refs. O.R.S.

Extraction of the wood of *E. alphitonioides* yields a saponin, an essential oil and a free triterpene acid $C_{30}H_{46}O_5$, for which the name emmolic acid is proposed. *From authors' summary.*

1006. AMORÓS-MARÍN, L., TORRES, W. I., and ASENJO, C. F. **Isolation of cycloeucalenol from West Indian Mahogany wood [*Swietenia mahagoni*].** *J. organ. Chem.* 24 (3), 1959 (411–3). 3 refs. O.R.S.

813.3. Ash Constituents

1007. BETHGE, P. O., and TROËNG, T. **Determination of chlorine in wood, pulp and paper.** *Svensk PappTidn.* 62 (17), 1959 (598–601). 8 refs. [E.e.sw.g.] P.R.

Small amounts can be determined by burning the material in O at atmospheric pressure, adsorption of the chloride formed in water, and potentiometric titration. The method is suitable for Cl contents $> 0{\cdot}1$ mg./g. and is more accurate than conventional procedures. *From authors' summary.*

1008. RICCI, E. Determinación espectrofotométrica de sílice en maderas. [**Spectrophotometric determination of SiO_2 in wood.**] *Proc. 4th World For. Congr., Dehra Dun 1954* Vol. 2, 1957 [1959], (598–600). [Span.]

Describes the adaptation of a technique developed for the study of animal tissues, which makes it possible to determine the SiO_2 content of wood from much smaller samples than are needed for chemical analysis.

813.4. Chemical Effects of Heat. Chemistry of Thermal Decomposition

1009. BLACKWOOD, J. D., and MCTAGGART, F. K. **A new approach to carbon gasification.** *Nature, Lond.* 184 (4684), 1959 (447–8). 3 refs.

Terms such as 'active sites' and 'active centres' have long been used in describing the reactions of carbons with gases, without any specific knowledge of either the real nature or real function of such 'sites'. Recent work in the Chemical Research Laboratories on chars of *Eucalyptus marginata* has thrown some light on both the nature and the action of at least one common type of reactive centre.

813.6. Effect of Chemicals on Wood. Resistance to Chemical Attack

See Nos. 1075, 1104.

814. Natural Durability. Old Wood. Fossilized Wood

See also sections 844 and 845, and No. 249.

1010. AARON, J. R. **Home-grown softwoods in London Docks: a useful service record.** *Quart. J. For.* 53 (3), 1959 (237–41).

Scots Pine timber from the west of England is still in service in the Docks, as beams, trusses, queen posts and struts in warehouses known to have been built in 1803–5. Some surface checks were found in the wood, but knots were infrequent, and wane and beetle damage absent. Decay had occurred at the ends of some of the beams where they are let into the walls.

1011. SEN, J., and BASAK, K. **The chemistry of ancient buried wood.** *Geologiska Föreningens i Stockholm Förhandlingar, Stockholm* 79 (4), 1957 (737–58 + 2 plates). 3 pp. of refs. [E.e.] O.R.S.

A review, under the headings: the general chemical nature of buried wood (variable preservation of lignin and cellulose, pentosans, interpretation of analytical data, the cellulose/volatile matter relationship, ash, moisture, extractives, density as indicating decay), the principal factors in decay, and lignin decomposition and the origin of humus. [Cf. *F.A.* 18 No. 860.]

815. Effect of Growth Factors on Structure and Properties

See also Nos. 516, 861, 921–2, 960, 970, 976, 1155–8.

1012. ALDRIDGE, F., and HUDSON, R. H. **Growing quality softwoods.** *Quart. J. For.* 53 (3), 1959 (210–9). 2 refs.

The introduction of the concepts of 'juvenile' and 'adult' wood into the problem of quality as affected by rate of growth [cf. *F.A.* 19 No. 4816; 20 No. 2351] is thought to confuse the issue. American literature on the subject is discussed [cf. *F.A.* 19 No. 2330; 20 No. 989]. The need for more research into the nature of slow-grown 'juvenile' and fast-grown 'adult' wood is stressed, and it is urged that the rate of growth is far more important to quality than the 'juvenility' or 'maturity' of the wood.

1013. ERICKSON, H. D., and LAMBERT, G. M. G. **Effects of fertilization and thinning on chemical composition, growth and specific gravity of young Douglas-Fir.** *For. Sci.* 4 (4), 1958 (307–15). 10 refs.

Shows the lignin, cellulose and ash content, wood extractives and growth for 4 years before and after treatment, of wood samples from 1 co-dominant each (in a 30-year stand) from $\frac{1}{10}$-acre plots that had been (*a*) fertilized [see *F.A.* 19 No. 417], (*b*) crown-thinned (leaving 107 trees in the plot), (*c*) fertilized and thinned or (*d*) left as a control (381 trees/plot). In most cases there was no significant difference in chemical composition between wood formed before or after treatment. Cellulose content and sp. gr. were reduced most by (*c*), which gave the highest growth rate and showed the only significant reduction in late-wood %. The increased volume increment from (*c*) had a much higher fibre weight than (*d*), even after allowance for a decrease in sp. gr., which may be of practical importance for the pulp industry. Much further research is needed, to include different geographical areas, age classes and sites.

1014. HURŠUDJAN, P. A. Nekotorye dannye o svjazi meždu širinoj godičnogo sloja i fiziko-mehaničeskimi svojstvami drevesiny dubov Armenii. [**Some data on the relation between annual ring width and the physical and mechanical properties of the wood of Armenian Oaks.**] *Repr.* from *Izv. Akad. Armjansk. SSR (biol. sel'.-hoz. Nauki)* 11 (4), 1958 (33–43). 2 refs. [Russ.arm.]

Using data from tests on 6304 samples from 24 specimens of Oak (*Quercus araxina, Q. iberica* and *Q. macranthera*) from different forest types [cf. *F.A.* 20 No. 1610], graphs were drawn of the variation with ring width of hygroscopicity, tangential and radial swelling, density, tangential and radial shrinkage, water absorption, static bending strength, end-grain hardness, compression $\parallel$ and $\perp$, and tangential and radial shear. Correlations were clear for static bending and compression strengths, but less clear for hardness, density, water absorption and swelling. Shrinkage and hygroscopicity showed no real correlation with ring width. Anatomical

investigations on the proportions of large vessels and of libriform fibres were made on wide-, medium- and narrow-ringed samples from static bending tests. General results showed that wood with narrow rings not only had lower mechanical strength but was also less constant in its properties than wide-ringed wood.

82. Conversion, Shaping, Assembly and Finishing of Wood: General

1015. Gruppenschau Holzbearbeitungsmaschinen auf der Deutschen Industrie-Messe Hannover 1959. **[Exhibition of woodworking machines at the German Industries Fair, Hanover 1959.]** *Holz Roh- u. Werkstoff* 17 (8), 1959 (suppl. pp. 5–19). [G.] P.R.

Brief descriptions with illustrations and some specifications of exhibits by over 35 firms, mainly German.

1016. Rückschau auf die Deutsche Industriemesse Hannover 1959. **[The German Industries Fair, Hanover 1959, in retrospect.]** *Holz-Zbl.* 85 (73/74), 1959 (943 . . . 967). [G.]

Describes woodworking machines and equipment, including a giant chain-saw for the ripsawing of exotics (Dolmar), and veneer driers working with a series of air-vapour jets. In one model (Fleissner & Sohn, Frankfurt a/M.-Egelsbach) a layer of rapid-moving hot air is maintained round perforated drums carrying the veneer by a combination of suction and pressure. Drying times are given as 0·5 to 8 minutes. [Cf. *F.A.* 20 No. 1108.]

1017. Obloja, P. Folosirea izotopilor radioactivi pentru protecţia muncii în industria de prelucrare a lemnului. **[The use of radioactive isotopes for the protection of workers in the woodworking industry.]** *Industr. Lemn.* 7 (6), 1958 (220–8). 7 refs. [Rum.russ.g.f.e.]

Deals with applications to work safety in the use of mechanical equipment, apparatus involving fluids under pressure, work with chemicals, fire prevention and detection, and prevention of accidents due to electrical phenomena.

821. Barking

See also No. 533.

1018. Fenchel, U. Untersuchungen über die Entrindungsfähigkeit von Pappelholz bei thermischer Vorbehandlung und nachfolgender Trommelung. **[Ease of barking of Poplar in drum barking after hot-water treatment.]** *Wochenblatt für Papierfabrikation, Biberach* 86 (18), 1958 (793–6). [G.g.] P.O.

Freshly felled Poplar was drum-barked in 43 min. after receiving 4 hours' hot-water treatment at 90° C., whereas untreated Poplar took 2 hours to bark.

822. Saws and Sawing

1019. **Handsaws.** *Extr.* from *Rep. Dir. For. Prod. Res., Lond. 1958*, 1959 (16–8).

Assesses the performance of a handsaw fitted to an automatic testing machine [described in detail] by counting the number of strokes required to cut a certain depth of wood. Detailed results are tabulated showing the effect on performance of variations in the hook and bevel angle in cross-cutting and ripsawing Scots Pine and Beech.

1020. Lowery, D. P. **Effect of moisture content on the power required to saw logs.** *Res. Note Intermt. For. Range Exp. Sta.* No. 62, 1959. pp. 4.

The limited data obtained from sawing 3 logs of Ponderosa Pine suggest that sprinkling logs increases their moisture content and that this reduces the amount of power needed to saw them, and also the amount of end checking and blue stain. Further experiments appear to be justified.

1021. Strumingher, A. Contribuţii la determinarea mărimii înclinării pînzelor de gater. **[The determination of the amount of overhang in the blades of a framesaw.]** *Industr. Lemn.* 7 (10), 1958 (364–7). [Rum.russ.g.f.e.]

The author contests the common assertion that the amount of overhang of sawblades is independent of feed speed, and concludes that there is a close relation between overhang and the speed with which the log advances by means of any kind of feed mechanism, viz. that overhang in mm. should be 45% of the advance of the log (also in mm.) during the upward stroke of the saw.

1022. Suciu, P. N. Ferăstraie circulare, aspecte privind construcţia maşinii şi a uneltei tăietoare. **[Circular saws: aspects of machine and tooth design.]** *Industr. Lemn.* 7 (5), 1958 (176–81). 12 refs. [Rum.russ.g.f.e.]

Describes the different types of circular saw blades designed to reduce power consumption, with particular reference to blades with teeth made of hard metal alloys.

1023. Cristian-Comes, I., and Seewaldt, R. Rolul cuţitului divizor la ferăstraiele circulare de tăiat în lung. **[The important rôle of the riving knife in rip-sawing with circular saws.]** *Industr. Lemn.* 7 (8), 1958 (292–7). 16 refs. [Rum.]

Discusses the function of the riving knife and describes the way in which it should be located and mounted so as to comply with safety regulations.

1024. Jakunin, N. K., and Hasdan, S. M. Ob ustojčivosti i vibracii diskov kruglyh pil pri pilenii. **[The stability and vibration of the blades of circular saws during work.]** *Derev. Prom.* 6 (8; 9), 1957 (11–4; 14–5). 1 ref. [Russ.russ.] P.R.

A series of experiments was made at CNIIMOD to investigate the influence of (1) the mean kinematic angle of incidence, (2) thickness of the sawn material, (3) feed per tooth, (4) saw speed, and (5) the amount of blade tensioning, on the vibration of circular saws, and on the quality of the sawn wood surface. Details of the results are tabulated. It is considered that if vibrations are artificially imparted to a blade whose teeth carry no set, the blade would work normally and give a clean cut. The vibration of such discs had no significant influence on the cleanness of the saw surface, but chip thickness and the manner in which the chip is formed did exert an effect. It is considered that the vibration of the

blades cannot serve as a criterion for working out tensioning schedules. These conclusions are maintained against those of P. I. Lapin whose work is criticized for use of incorrect experimental methods. [Cf. *F.A.* 19 No. 3469.]

1025. YAKUNIN, YA. K. [JAKUNIN, N. K.], and KHASDAN [HASDAN], S. M. **Stability and vibration of circular saw discs during operation.** *Transl. Commonw. Sci. Industr. Res. Organ. Aust.* No. 4069, 1958. pp. 14 + 2 photos, 1 dgm., 1 gph. Transl. by E. Feigl from *Derev. Prom.* 6 (8; 9), 1957 (11–4; 14–5). [See preceding abstract.] Limited distribution.

1026. DAVYDOVA, N. I. Opredelenie režima raboty kruglopil'nyh stankov dlja prodol'nogo raspilivanija. [**Determining operating variables for circular rip-saws.**] *Derev. Prom.* 6 (7), 1957 (9–13). 5 refs. [Russ.] P.R.

A detailed mathematical study of the influence on the specific work, quality of cut, power, and cutting force, of the saw speed, angle of incidence, chip thickness, and hook. Some of the findings are presented in graphs, and a nomograph is constructed for choosing the correct saw diameter in relation to the depth of cut, and for determining the angle of incidence and the quality of cut.

1027. MARCHOVELETTE, R. G. D'O., and FAGNERAY, A. J. Contribution à l'étude du sciage du bois. I. Le 'bombé' des planches au cours du sciage. II. L'épaisseur des planches et la puissance nécessaire au sciage. [**A contribution to the study of the sawing of wood. I. 'Camber' of boards in the course of sawing. II. The thickness of boards in relation to the power required to saw them.**] *Publ. Inst. Nat. Étude Agron. Congo Belge* (*Sér. tech.*) No. 56, 1959. pp. 37 + 5 photos. [F.]

(I) A study was made of the cause of uneven thickness in boards, when the middle of the board is either thicker or thinner than its edges, a defect that commonly occurs in band-sawing. Factors involved are feed speed, saw speed, and tension of the saw blade (particularly on the tight side). Methods of setting the saw so as to prevent this trouble are discussed. (II) In small-scale experiments on a log of *Pentaclethra macrophylla* using the same band-saw blade, the results of which were statistically analysed, it was found that power consumption rose significantly with increasing board thickness from 0·5 to 1·2 cm.; from 1·2 to 3 cm., the increase in power consumption was not significant. Further experiments are desirable.

1028. ANTOINE, R. C., BERBEN, J. C., and SAUVAGE, G. Le débit des bois à la scie à ruban. IV. Étude du sciage de *Gossweilerodendron balsamiferum* (Tola). [**Conversion by bandsaw. IV. Sawing *G. balsamiferum*.**] *Publ. Inst. Nat. Étude Agron. Congo Belge* (*Sér. tech.*) No. 57, 1959. pp. 41. [F.]

[Cf. *F.A.* 20 No. 2366.] The study was made on two logs, using reinforced teeth having 5, 15, and 25° hook, 50 mm. pitch, and a saw speed of 1200 m./min. It is concluded that a hook of 25° and a bite of 800μ for 20 cm. depth of cut, are best for sawing this species. A chart is given showing desirable combinations of feed and saw speed, power at the saw, and depth of cut.

1029. Der Auer-Welsbach-Zahn. [**The Auer-Welsbach tooth [for band saws].**] *Holz-Zbl.* 85 (97), 1959 (1274). [G.]

Describes and illustrates an improved Austrian tooth pattern for the sawing of frozen or wet logs, characterized by great pitch (up to 10 cm.), enlarged tooth gullets and increased hook and, in particular, a double swage, the second swage reaching nearly down to the base of the teeth.

1030. JOHNSON, G. A. **New techniques, developments in ripsaws and moulders.** *For. Prod. J.* 9 (6), 1959 (17*A*–20*A*).

An illustrated article describing *inter alia* variable-speed drive units for ripsaws and attachments that replace mechanical handling. *From author's summary.*

823. Planing. Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning

1031. **Theory of cutting.** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1958*, 1959 (15 + 1 plate).

Describes improvements in the instrumentation of a low-speed, rectilinear apparatus [illustrated] used in studies of the theory of cutting. Results of studies on the relation between chip thickness and forces $\parallel$ and $\perp$ to the cutting direction are shown in graphs for Beech. Other variables whose effects are measurable are density, m.c. and grain orientation.

1032. SUCIU, P. N. Unele aspecte actuale privind rindeluirea şi construcţia maşinilor de rindeluit. [**Planing and the construction of planing machines.**] *Industr. Lemn.* 7 (6), 1958 (214–20). 7 refs. [Rum.russ.g.f.e.]

A theoretical discussion of the process of planing with a description of recent improvements in the design of planing machines.

1033. HYLER, J. E. **Smooth-running cutterheads for molders.** *Wood-Worker, Indianap.* 78 (5), 1959 (23–4). P.R.

Discusses the importance of end-balancing long knives, before placing in the cutterhead when H.F. current is used for moulders running at $\geqslant$ 3600 rev./min. The limitations of H.F. operation are mentioned.

1034. MORI, M., and HOSHI, T. [**Effects of cutterhead speed, feed speed and setting precision of knives on the surface roughness of wood in planing.**] *J. Jap. Wood Res. Soc.* 5 (3), 1959 (111–6). 7 refs. [Jap.e.*e.*] P.R.

Describes rotary planing tests (8 runs at 4560 rev./min.) made to ascertain the effect of knife pitch and setting precision on surface roughness. Comparative results for 22 Japanese species are tabulated.

1035. MANŽOS, F. M., and BUHTIJAROV, V. P. O racional'noj sheme raspoloženija noževyh valov v strogal'nyh stankah. [**A rational system for arranging the cutter-block spindles in planing machines.**] *Derev. Prom.* 8 (1), 1959 (9–13). [Russ.]

Gives detailed results of investigations made on an experimental four-cutter jointing and planing machine in which the working spindles could be used in all the possible combinations of the vertical and horizontal.

1036. KUGEL', I. S. O frezerovanii listvennyh porod drevesiny. **[Working hardwoods with rotary cutters.]** *Derev. Prom.* 7 (6), 1958 (11–4). 8 refs. [Russ.russ.] P.R.

Trials were made on Oak and Birch with a rotary cutter having cutting angles of 51·5, 62·5 and 73·5°, cutting speeds 28–70 m./sec., diam. of cutting arc 210 mm., feed speeds 1·3–28·9 m./min., and chip thickness 0·025–0·55 mm. It was found that with increasing chip thickness (*a*), the specific work of cutting (*b*) fell, both for longitudinal and transverse cutting. This law was influenced by the wood species (*c*), angle of incidence (*d*), cutting angle (*e*), and cutting speed (*f*). The change in (*b*) in relation to the change in (*d*) also depended on (*c*), (*e*), (*f*), and on the direction of cutting. In all cases, with a change in (*d*) from 180 to 90° and from 0 to 90°, (*b*) increased. Increasing (*e*) from 51·5 to 73·5° also led, in every case, to an increase in (*b*), which also increased with (*f*), the amount of increase depending on (*c*), (*d*) and (*e*). When cutting with the grain, (*f*) values > 40–50 m./sec. did not significantly improve wood surface quality, but when working against the grain, an increase in (*f*) up to 70 m./sec. did so noticeably. When working with the grain, an increase in (*a*) from 0·075 to 0·32 mm. did not affect the cleanness of cut, but with (*a*) = 0·55 mm. a slight reduction of surface quality was observed. In cutting both species against the grain, an increase in (*a*) caused a sharp fall in surface quality, and only with (*a*) = 0·025 mm. and (*f*) = 69 m./sec. was an absolutely clean surface obtained for any value of (*d*); the poorest results were with (*d*) = 30–50°. An increase in (*a*) from 0·13 to 0·55 mm. impaired the surface quality when working across the grain, but with values of (*a*) up to 0·13 mm., no defects were observed at any values of (*e*) and (*f*). With an increase in (*f*), the surface quality improved even for high values of (*a*), quality reaching a maximum at (*f*) = 69 m./sec.

824. Forms of Joint. Jointing and Assembly

824.7. Glued Joints

1037. RICHARDS, D. B., and GOODRICK, F. E. **Tensile strength of scarf joints in Southern Pine.** *For. Prod. J.* 9 (6), 1959 (177–9). 2 refs.

In standard tests on straight-grained samples (mostly Loblolly) strength increased markedly with length of slope and slightly with sp. gr. Strength values, though high absolutely (11,682 lb./sq. in. for slope 1·6 to 17,620 for slope 1·15, in both cases for a mean oven-dry density of 0·55), were only 53·8 to 81·2% of those of solid matched controls. Matching of growth rings had little or no effect. With the resorcinol and urea-formaldehyde types of adhesive used, high-temperature curing was not needed to obtain normal dry strength.

824.8. Glues and Gluing

See also Nos. 913, 1067–8.

1038. **Trouble shooting glue problems.** *For. Prod. J.* 9 (6), 1959 (11*A*–16*A*).

A panel discussion covering: Animal glues for assembly and edge gluing (*R. C. Gill*); Urea resins for hot- and cold-press hardwood plywood (*C. C. Booth*); Urea resins for RF and heated-platen edge gluing (*L. E. Clark, Jr.*); and Polyvinyl resins for high-pressure plastic laminating (*P. H. McCormack*).

1039. ZIEGLER, J. L. **Mechanized foaming of adhesives.** *For. Prod. J.* 9 (7), 1959 (233–6).

Describes a mechanized process using a foam-stabilizing chemical as an addition to the mix, and discusses advantages and applications (particularly for highly porous materials). [Cf. *F.A.* 20 No. 3762.]

1040. KNIGHT, R. A. G. **The durability of cold-setting phenolic and resorcinol glues in wooden structural units exposed to the sun.** *Wood* 24 (8), 1959 (330–2). 7 refs.

Describes and discusses from the literature the effects of insolation on glued joints. It is concluded from tests on various types of test piece made with cold-setting phenolic and resorcinol glues, that degrade from insolation is negligible.

1041. HORIOKA, K., *et al.* **[Research for the improvement of wood (Rep. No. 7). The synthesis and its property of adhesion of urea formaldehyde resin adhesive made from radioisotope urea.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 113, 1959 (1–20). 6 refs. [Jap.e.*e.*]

A detailed report (with 6-page English summary) of a study of adhesion, using an adhesive labelled with C^{14}, and leading to an improved method of preparing urea-formaldehyde resin by adding more urea and formalin to the original mixture when it has reached 85° C. This greatly improves adhesiveness of the glue.

1042. HORIOKA, K., NOGUCHI, M., and SAITO, M. **[Research for the improvement of wood (Rep. No. 8). On the latent hardener of urea-formaldehyde resin adhesive.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 113, 1959 (21–36). 20 refs. [Jap.e.*e.*]

As a result of experiments to find a more satisfactory hardener than NH_4Cl (the commonly used one), recommends a mixture of pyridine and $CH_2Cl{\cdot}COOH$ or a mixture of pyridine and $(NH_4{\cdot}SO_3)_2NH$.

1043. HORIOKA, K. **[Studies on plywood (Rep. No. 10). On the effects of addition of paraffin wax emulsion to urea-formaldehyde resin adhesive upon the adhesion property of plywood.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 113, 1959 (51–6). 2 refs. [Jap.e.*e.*]

Addition of 10–20% of paraffin-wax emulsion to urea-formaldehyde resin, lowered the viscosity of the glue but did not significantly alter its pH. Normal adhesion of plywood was not changed, but water-proof adhesion was slightly less, and vapour-permeability was $\frac{1}{2}$–$\frac{1}{3}$ of that in plywood glued without the addition.

1044. **Borer control in plywood.** *Extr.* from *Rep. Dep. Sci. Industr. Res. N.Z. 1958/59*, 1959 (18).

Infestation with *Anobium punctatum* is a major cause of wood deterioration in New Zealand, and

plywood is particularly susceptible. Since pre-treatment of veneers with preservative has proved impracticable, an investigation was begun in 1954 to determine the effectiveness of residual contact insecticides incorporated in the glue line. A series of 3-ply panels of Kahikatea [*Podocarpus dacrydioides*] veneer, $\frac{1}{16}$ and $\frac{1}{10}$ in. thick were prepared, using casein, urea-formaldehyde and phenol-formaldehyde resins in which dieldrin was included at 9 rates between 0·025% and 4% of glue weight. These, together with a comparable set of panels without dieldrin, were exposed to *Anobium* attack, first in the 1954–55 season and again in subsequent seasons. To date, only the untreated panels have become infested, and manufacturers have been recommended to incorporate 0·25% dieldrin in glue for plywood. The test panels will continue to be exposed to borer attack annually in order to determine the expected life of the treatment.

1045. POUND, J. **Radio frequency heating in the wood trade.** *Comp. Wood* 5 (2/3), 1958 (32–40). P.R.

Describes the characteristics of the glues used in, and examines the basic theory of, R.F. heating, mentioning the three main methods of application, (*a*) through heating, (*b*) glue-line heating, and (*c*) stray heating, electrode disposition being illustrated diagrammatically in each case. The importance of obtaining even curing times, and of using sufficient pressure to avoid foaming is stressed, and the numerous applications to which R.F. heating is now put are reviewed.

1046. MORUŠKIN, G. V. O režimnyh faktorah pri skleivanii drevesiny s podogrevom TVČ. **[Schedule factors to be considered in gluing wood by R.F. heating.]** *Derev. Prom.* 8 (2), 1959 (19–20). 1 ref. [Russ.] P.R.

Gives suggestions, based on production experience, relating to the main factors to consider (optimum room tempeature and r.h., wood m.c., glue-line width, heating temperatures and duration, etc.) in gluing wood by the R.F. method.

1047. SANDWEG, K., and BRÜNING, H. Hochfrequenzverleimung von Schichtparkett. **[R.F. gluing of layer parquet flooring.]** *Holz-Kurier, Wien* 14 (35), 1959 (12–4). [G.]

Discusses the merits of various types of parquet flooring, including solid blocks, thin 'mosaic', and various layer constructions combining thin layers of high-grade hardwoods with cheaper base layers, and the methods, particularly R.F. gluing, for manufacturing these.

825. Cleaving. Adzing. Mechanical Comminution.

See also Nos. 541–3, 1058.

1048. MEISTER, K. Der Prallzerfaserer. Eine neuzeitliche Holzzerkleinerungsmaschine. **[The impact 'defibrator', a modern wood-comminution machine.]** *Holz-Kurier, Wien*, 14 (35), 1959 (18–9). [G.]

The machines described, which work by hurling the wood, pre-chipped into short lengths, centrifugally against serrated segments fitted to conical disks, are claimed, because they use no knives, to be suitable for chipping waste containing dirt or glue, e.g. chipboard and fibreboard waste, and shavings from telegraph poles. The chips produced (suitable for the manufacture of particle board) are round and rather rough, but fine-grinding models also exist.

826. Peeling. Slicing. Trimming, Edging etc. of Thin Sheets

See Nos. 1063–5.

827. Bending. Moulding (other than by Cutting)

1049. **Wood bending: solid bending; laminated bending.** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1958*, 1959 (10).

Experiments to determine the bending properties of 9 British-grown softwoods (including Douglas Fir, Japanese Larch and Sitka Spruce) and Ash indicated that they were intrinsically superior to many tropical hardwoods tested, but their gross properties and commercial values were adversely affected by knots. Experiments on *Carya* sp. confirmed its good bending properties, but bent specimens were very liable to check in drying and setting. From tests to determine the limiting radii of curvature of thin laminae obtained from 6 hardwoods and 7 softwoods, it was found that quarter-sawn softwoods bend to a significantly smaller radius than matched flat-sawn material, but that diffuse-porous hardwoods (Beech, Birch, etc.) bend to a smaller radius when flat-sawn. The bending properties of laminae cut from ring-porous hardwoods, e.g. Oak and Ash, seem little affected by the method of conversion.

829.1. Finishing

See also No. 913.

1050. GRAHAM, P. H. **Flappers sand plywood.** *Veneers & Plyw.* 53 (6), 1959 (6, 13–5). P.R.

Describes a straight-through plywood-sanding device consisting essentially of a metal drum [widths obtainable, 12–60 in.] in a mounting frame, to which coated abrasive strips, or flaps, are attached by metal clips. Sanding is done by the ends of the radially disposed flaps whose abrasive action is controlled by varying their number (e.g. a 16-in. 'flap-wheel' may carry up to 1000 flaps of uniform size and thickness). Working speeds are given for different operations, e.g. sanding sealer in panels in pre-finishing line, white-wood sanding, etc., but effective flap-wheel speeds do not exceed 4000 surface ft./min., spindle speeds being determined by wheel diameter. Though mainly used for flat sanding in square-end plywood panels, the flap-wheel may also be shaped for contour sanding.

1051. JAKUBOVIČ, S. V., and NAGORSKAJA, I. A. Primenenie poliefirnyh lakov pri otdelke mebeli. **[The application of polyester varnishes in furniture finishing.]** *Derev. Prom.* 8 (1), 1959 (6–8). [Russ.] P.R.

Describes the properties, uses and application of one English and several new Soviet polyester lacquers. Results of wood-adhesion and moisture-resistance tests are tabulated.

1052. **[Over-lay treatment of wood-based materials.]** *Wood Ind., Tokyo* 14 (9), 1959 (1–60). Many refs. [Jap.] P.R.

Includes 22 review articles [in Japanese with English titles] by different authors, on the overlay treatment of wood-based materials as used in shipbuilding, architecture, vehicle and furniture manufacture. An article on the machines and apparatus used for finishing is included.

83. Timber Manufacturing Industries and Products. Uses of Wood as Such

831. Fuelwood and Various Types of Rough Timber

See also Nos. 543, 1092–3, 1136–7, 1148–9.

1053. Considérations sur l'emploi de traverses en bois par la compagnie des chemins de fer du Congo Supérieur aux grands lacs africains. **[The use of wooden railway sleepers by the CFL (Upper Congo to Great Lakes).]** *Bull. agric. Congo belge* 50 (3), 1959 (801–3). 2 refs. [F.]

[Cf. *F.A.* 17 No. 2113.] Traces the history of railway sleeper use, section by section, as the network was constructed from 1903 to 1959. The first section, constructed through dense forest, was laid on wooden sleepers, hand hewn, untreated, and with little selection as to species; their life was $\leqslant$ 2–2½ years. Preservative treatments tried were considered uneconomic. The next sections (1906–10 and 1910–15) turned to metal sleepers, the latter for the additional reason that it traversed savanna. Next, and long after, a connecting line was laid in 1937–39 with wooden sleepers. Since 1931, sleeper replacements had been sawn on 4 faces and only hard species used; mean life was now 4 years. Trials made in 1923–34 led to cold-creosote treatment which, with better choice of species, raised the life to 8 or 9 years. Because of urgency of construction and shortage of labour a last section was laid with metal sleepers. The cost of treatments with oil-borne preservatives involving preliminary sap removal and drying, and the absorption of large quantities of creosote etc., is considered prohibitive. The use of water-soluble substances (e.g. Na arsenate) eliminates the need for drying but requires a hot tar seal for retention of the preservative; this seal is unnecessary with Basilit U.A. (a Cr/As combination) which, in 5 years' study, has given extremely promising results. A service trial of 1000 *Macrolobium dewevrei*, some treated by the Lebacq process with Basilit (3), and others soaked in hot arsenic (5·8), hot Basilit (10·6), cold Basilit (11·7), untreated controls (55), resulted in the % losses shown in brackets, after 56 months. Orders for metal sleepers have been discontinued and present metal sleepers will eventually be replaced by wood.

1054. Benić, R. Minimalni promjer trupaca i maksimalno učešće crvenog srca kod pragovske oblovine. **[The minimum diameter of logs and maximum proportion of red heart in Beech for railway sleepers.]** *Drvna Ind.* 9 (3/4), 1958 (34–40). [Croat. e.] P.R.

Makes mathematical calculations and suggests changes in the Jugoslavian standard specifications for logs for sleepers, presenting tables for both half-round and fully sawn sleepers.

832. Mills, Their Functions and Products

See also Nos. 1146, 1245.

1055. Fuchs, A. Mecanizarea şi automatizarea în industria lemnului. **[Mechanization and automation in the wood industry.]** *Industr. Lemn.* 7 (5), 1958 (162–76). 20 refs. [Rum.russ.g.f.e.]

Reviews the technological processes that take place in sawmills, parquet, plywood, and furniture factories, and seasoning plants, and describes the current methods of mechanization and automation of series of operations within such processes, with reference mainly to Rumanian, Russian and German practice.

1056. Obloja, P. Televiziunea în serviciul industriei lemnului. **[Television in the service of the wood industry.]** *Industr. Lemn.* 7 (10), 1958 (367–73). 20 refs. [Rum.russ.g.f.e.]

Discusses possible and actual uses, e.g. for observation of processes carried out in positions difficult of access or dangerous to operatives, for the continuous control of operations in large industrial plants etc.

832.1. Sawmills and Planing Mills

See also Nos. 812, 891, 1020 *et seq.*, 1142, 1152–3.

1057. Emel'jančikov, A. N., Lejhtling, K. A., and Tarant, K. A. Šire ispol'zovat' nizkosortnoe syr'e v lesopilenii. **[Making wider use of low-grade wood in sawmilling.]** *Lesn. Prom.* 1959 (8), (22–3). [Russ.russ.]

Fuelwood has been said to form 12–21% of the total standing volume of coniferous stands in Siberia. To investigate the possibilities of using some of this wood as sawtimber or for box shooks, 1800 fuelwood logs were examined and divided into 10 characteristic quality groups (e.g. with mechanical damage, big knots, occluded injuries, heart rot, etc.). Logs with heart rot, which formed 50% of the fuelwood logs examined, were further divided into 6 sub-groups. The total yields of sawn timber from the various quality groups of fuelwood are indicated; they vary from 21 to 56·5% of log volume. Methods of breaking down logs damaged by heart rot are described and illustrated. It is considered economically justifiable to break down low-grade wood (fuelwood) on frame saws when the useful yield of sawn timber is $\lessdot$ 30%, and on circular saws where it is $\lessdot$ 35–37% of log volume.

1058. **[Some Russian timber-handling machines.]** *Lesn. Prom.* 1959 (6), (21–3 + 1 tbl., 1 set of drawings). [Russ.]

Describes and illustrates a hoist for loading sawn timber on to the table of a saw or planer, an electromechanical log ejector, a movable, 6-bladed, drum-type chipper, and a movable, cable-type sorting conveyor.

1059. Monsberger, S. Stetigförderer in der Sägeindustrie. **[Continuous conveyors in the sawmill.]** *Int. Holzmarkt* 1959 (15/16), (25 . . . . 34). [G.]

An illustrated account, based on practical

examples, of the use of conveyors in bringing the round wood from the log pond to the saws, removing the sawn wood from the saws, and sorting and grading.

1060. MINKOV, N., *et al.* Vărhu randemana na trupite za bičene. [**Recovery % in sawing logs.**] *Nauč. Trud. Lesoteh. Inst., Sofia* No. 6, 1958 (239–45). 2 refs. [Bulg.g.]

Presents improvements to the formulae, and to the corresponding nomographs, developed in earlier work [see *F.A.* 20 No. 1102].

1061. GRANTHAM, J. B. **Procedures to study lumber recovery.** *Inform. Circ. Ore. For. Prod. Res. Cent.* No. 14, 1959. pp. 29.

The procedures described are mainly those involved in determining yields of lumber from batches of logs. Methods of study by individual logs are not described.

1062. ***Pinus strobus* grade recovery.** *Suppl.* to *Newslett. N.Z. For. Serv.* 9 (5), 1959. pp. 3.

Reports on a mill study of thinnings from a 42-year stand of *P. strobus* at Whaka forest and trees clear-felled in a 50-year stand at Waiotapu. Recovery of higher grades was much better than in *P. radiata* because of smaller branches, small pith and absence of cone holes.

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-Wood Assemblies

See also Nos. 937, 963, 1038 *et seq.*, 1049–50, 1135, 1169.

1063. KUMAR, V. B. Die Anwendung der statistischen Gütekontrolle an Furnierschälmaschinen. [**Application of statistical quality control to veneer peelers.**] *Holz Roh- u. Werkstoff* 17 (2), 1959 (64–71). 14 refs. [G.g.e.] P.R.

Describes investigations on two lathes (one new, one old) peeling Beech and Spruce. The performances of both machines were statistically analysed, and the practical economic aspects of frequency of sampling and size of samples in statistical quality control are discussed.

1064. HORIOKA, K., MATSUMOTO, T., and MORIYA, K. [**Studies on plywood (Rep. No. 9). On the gluing properties of Klampeyan [*Anthocephalus cadamba*] wood.**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 113, 1959 (45–50). 5 refs. [Jap.e.*e.*]

Veneer can be cut satisfactorily on a rotary cutter, especially if the log is pre-treated by steaming. Adhesion strength of the plywood is high compared with Lauan plywood. Disadvantages are a tendency to be attacked by moulds (possibly owing to its high hemicellulose content), and an unpleasant smell immediately after cutting.

1065. WANGAARD, F. F., and SARAOS, R. P. **Effect of several variables on quality of rotary-cut veneer.** *For. Prod. J.* 9 (6), 1959 (179–87). 5 refs.

Describes first results of a continuing study evaluating quantitatively the effect of the controllable lathe variables on the quantity of $\frac{1}{8}$-in. and $\frac{1}{16}$-in. veneer cut from logs of White and Red Lauan (*Pentacme contorta* and *Shorea negrosensis*). Knife angle affected chiefly the uniformity of thickness, and nose-bar compression (the combined effect of horizontal and vertical openings), the thickness, smoothness, and 'tightness' (evaluated in terms of depth of checks, and tensile strength ⊥). Even the tightest $\frac{1}{8}$-in. veneer, cold-cut, had $< 30\%$ of the tensile strength of the original wood; $\frac{1}{16}$-in. veneer cut from a bolt preheated in water at 160° F. was twice as strong as $\frac{1}{16}$-in. cold-cut veneer.

1066. TSUTSUMOTO, T., and SATO, S. [**Veneer drying. (I) Experiments on air supply, veneer feeding method and thermal efficiency in the cross-circulation type veneer drier. (II) Experiments on air condition and veneer drying in the Coe-type roller-feed drier.**] *Bull. For. Exp. Sta., Meguro, Tokyo* Nos. 106, 1958 (201–15); 107, 1958 (33–46). 12 refs. [Jap.jap. e.*e.*]

Chiefly a description of two types of driers and their technical problems. In II, results of drying Lauan veneer [*Parashorea, Pentacme* and *Shorea* spp.] are given.

1067. STEVENS, S. F. **Veneer tapes and taping.** *Veneers & Plyw.* 53 (6), 1959 (7, 25). P.R.

Discusses briefly and generally the gluability of various high-grade kraft paper tapes with high tensile and bursting strengths, as used in veneer splicing and end-taping to minimize splitting.

1068. YAGISHITA, M., and OKANISHI, T. [**Studies on plywoods (Rep. No. 8). On the manufacturing method of no-void and no-overlap plywood (No. 2). On the effect of splits of core veneer.**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 113, 1959 (37–44). 2 refs. [Jap.e.*e.*]

It was found that overlap of plywood was mainly due to elongation of the core as a result of glue spreading [cf. *F.A.* 18 No. 3379], and that this increased with decreasing thickness of core veneer. Splits in the core veneer also increased elongation, and end-taping of the core is recommended to prevent overlap and reduce splitting.

1069. NIWA, T., and TAKAMI, I. **Studies on glue-laminated wood (third report). On the existence of the strained limit values on damage caused by shrinkage between laminae in glue-laminated wood.** *Transl. For. Prod. Lab. Can.* No. 126, 1959. pp. 16. 6 refs. Transl. from *Report, Forest Products Research Institute, Hokkaido* No. 11, 1956. Limited distribution.

Presents theoretical and experimental results of studies on the strains set up in laminated wood by differing shrinkage in adjacent laminae.

833. Timber in Buildings and Engineering Structures (Manufacture and Use)

833.1. Building Components and Fittings: General

See also Nos. 1047, 1094–6.

1070. **Canadian building timbers.** *Wood* 24 (8), 1959 (322–5).

Discusses the 10 main species and grades used in the U.K., viz. *Chamaecyparis nootkatensis, Pinus monticola, Pseudotsuga taxifolia, Tsuga heterophylla,*

Thuja plicata and *Picea sitchensis*, from British Columbia, and *P. glauca*, *Pinus strobus*, *Betula lutea* and *Acer saccharum* from E. Canada, and outlines their use for frames, cross walls, flooring, etc. in house construction.

1071. TARRANT, R. K. **Fire risk of under-floor heating systems.** *Fire Prot., Lond.* 22 (227), 1959 (610–1). P.R.

Examines briefly the properties of wood when subjected to heat, and gives examples of the dangers encountered in the use of heating units near woodwork and timber structures, with suggested safety measures.

833.3. Special Uses in Factories and Workplaces

See No. 1104.

833.8. Wood in Hydraulic, River and Marine Uses

See Nos. 1097, 1106–7, 1123–4.

834. Shingles. Cooperage. Packing Containers. (Manufacture and Use)

1072. **[Special number on cooperage and manufacture of packing cases.]** *Industr. Lemn.* 7 (3), 1958 (81–111). [Rum.russ.g.f.e.]

Includes articles on: Conversion of Oak logs into lumber and staves (*J. I. Bulboacă* and *N. Fusiaru*); Revision of the Rumanian standard for Oak staves (*N. Ghelmeziu*); Manufacture of wine barrels out of laminated staves (*T. Orădeanu* and *I. Cornea*); The use of petrolatum for the seasoning and protection of Beech cases (*E. Vintilă*); The vibration-resistance test of wooden containers (*G. Luca*); and The supply of sawn Beech wood for wooden cases (*M. Hammer*).

1073. Tonelería de duelas de castaño. **[Barrels of Chestnut staves.]** *Hoja divulg. Serv. Madera, Madrid* No. 12, 1959. pp. [2]. [Span.]

Presents measurements of the components and dimensions of various types of Andalusian and Catalan barrel, with brief instructions as to their manufacture.

1074. NÁJERA, F. Informe al gobierno de la República Argentina sobre la reorganización y el mejoramiento técnico de la industria de envases de madera del país. **[Report to the Argentine government on the reorganization and technical improvement of the country's packing-case industry.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1030, 1959. pp. ii + 44. [Span.]

Surveys the economic importance and present state of the packing-case industry in Argentina and makes recommendations for its improvement. These include the setting up of a trade organization to regulate the industry, the establishment of a laboratory for testing and research, and investigations into the utilization of wood waste from the industry.

835. Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Applications etc.

1075. WILSON, K. W., and BUCHBERG, H. **Evaluation of materials for controlled air reaction chambers.** *Industr. Engng. Chem.* 50, 1958 (1705–8). From *abstr.* in *Prev. Deterior. Abstr.* 16 (9), 1959 (*Misc.* 33). D.S.I.R.

Among the synthetic and other materials tested for suitability in construction of air-reaction chambers for air pollution studies, were painted and silicone-coated wood [unspecified] and unpainted Maple. Both reacted rapidly with O_3 and are therefore unsuitable for use in such chambers.

839.8. Industrial Waste Wood, its Processing and Uses

See also Nos. 454, 527, 1183.

1076. **Country statements on the utilization of wood residues.** [*Docum.*] *17th Sess. Timb. Comm. Écon. Comm. Europe, 1959* Nos. *TIM*/160/*Add.* 1 & 3–5, 1959. Restricted.

The statements here referenced, dealing with both logging and industrial wastes, are for: (1) Germany (pp. 18; 107 refs.); (3) Sweden (pp. 7 + 1 tbl. + 1 dgm.); (4) United Kingdom (pp. 6); (5) U.S.S.R. (pp. 5).

84. Preservation and Other Treatments to Improve the Properties of Wood. Damage by Biological Agencies and its Control. Seasoning. Timberyard Practice

841. Wood Preservation

See also Nos. 1044, 1053, 1113–5, 1121, 1127, 1129, 1134–5, 1137, 1171–2.

1077. KOLLMANN, F. Die wirtschaftliche Bedeutung neuzeitlichen Holzschutzes. **[The economic importance of wood preservation today.]** *Holz Roh- u. Werkstoff* 17 (7), 1959 (261–7). 24 refs. [G.g.e.] P.R.

Illustrates, with examples from housing timbers, sleepers, poles, mining timbers and marine structures, how the very small extra cost of impregnated wood is far outweighed by increased durability.

1078. Gecoördineerde houtresearch. **[Co-ordinated timber research.]** *Houtbereiding, 's-Gravenhage* 4 (3), 1959 (12–5). [Du.]

Presents a tabulated summary of current German research on preservation of timber in buildings, giving a brief description of each project, the name of the institute or individual carrying out the work, and an indication of its progress.

1079. **Amenability to preservative treatment.** *Extr.* from *Rep. For. Dep. Tanganyika 1958*, 1959 (20).

Full-cell treatment was used at 200 lb./sq. in. (p.s.i.) for one hour, the temperature of the creosote being 180° F. The only permeable species was *Parinari excelsa*, which treated easily. Degrees of resistance varied from that of *Allanblackia stuhlmannii* and *Cephalosphaera usambarensis*, which required 2 hr. to give complete penetration, and *Diospyros abyssinica* and *Syzygium* sp. requiring 4 hr., to *Albizzia* sp., *Isoberlinia scheffleri*, *Millettia stuhlmannii* and *Newtonia buchananii*, which were highly resistant

or altogether impermeable. Other tests, on *Brachystegia spiciformis* and *B. microphylla*, showed wide variation in the permeability of different samples, but results showed that material that would not treat at 200 p.s.i. gained nothing from treatment at 1000 p.s.i. With incising, absorptions of 3–4 lb./cu. ft. were obtained, but penetration was limited to circular patches round the incisions.

1080. KOLLMANN, F., and SCHNEIDER, A. Sorptionsmessungen an mit Salzen imprägnierten Hölzern. **[Sorption measurements on wood impregnated with [protective] salts.]** *Holz Roh- u. Werkstoff* 17 (5), 1959 (212–8). 7 refs. [G.g.e.] P.R.

Preliminary investigations were made on samples of Spruce impregnated with a solution of cooking salt, and then on samples impregnated with 7 common commercial preservatives. In the climate where any wood is normally used (40–90% r.h.), results of sorption measurements show that sorption behaviour deteriorates with increasing content of salts. The application of protective salts is limited, in practice, by r.h. corresponding to the vapour pressure of the saturated aqueous salt solution. Therefore, preference should be given to salts that are efficacious at small loadings, and have a vapour pressure as high as possible in saturated aqueous solutions. *From authors' summary.*

1081. SHIBAMOTO, T., and INOUE, Y. **[Studies on water-borne wood preservatives. VIII. Relation between the hygroscopicity and the fixation phenomena of treated wood.]** *J. Jap. Wood Res. Soc.* 5 (3), 1959 (86–92). 9 refs. [Jap.e.e.] P.R.

[Cf. *F.A.* 20 No. 5240.] Examines the relation between the hygroscopic properties of a test block of *Cryptomeria japonica* sapwood (20 × 20 mm. cross-section, × 10 mm.) when treated with Wolman-type preservatives, and the phenomenon of fixation, bearing in mind the influence of the hygroscopic moisture of treated wood on the corrosive action of metal and electrical resistance. Methods of determining the critical r.h. at 37° C. of the components of non-volatile, water-borne preservatives [composition of each tabulated in English] are described, the results obtained being presented in graphs.

1082. HARRISON, D. L., and NAIRN, R. G. **Danger of using arsenic-treated timber for beehives.** *N.Z. J. Agric.* 98 (4), 1959 (338–9). 2 refs. O.R.E.

Tests with hives treated with Tanalith U and Boliden S 25 showed that preservatives containing As should on no account be used, as they are poisonous to bees [cf. *F.A.* 18 No. 2201].

1083. HARROW, K. M. **Toxicity of some arsenical wood-preservatives to the common house borer, *Anobium punctatum* de Geer.** *N.Z.J. Sci.* 2 (2), 1959 (208–11). 2 refs.

Tests of the toxicity to larvae of Boliden S 25, Tanalith C and U, and a stock solution containing 1·0% As_2O_5, applied to test blocks of sapwood of *Podocarpus dacrydioides*, showed that the toxicity of the three commercial preservatives was proportional to their As content and that the other elements present (Cr, Cu, Zn, F and dinitrophenol) neither contributed to their toxicity, nor reduced the availability of As in the wood. Larvae were able to survive at retentions of 0·01% As_2O_5 on an oven-dry wood basis, but retentions of 0·018% prevented their development.

1084. CARR, D. R. **The effectiveness of boron as a wood preservative.** *Timb. Technol.* 67 (2242), 1959 (335, 337–8). 23 refs.

Discusses toxicity to decay and sapstaining fungi, to insects (including termites), methods of application, etc.

1085. GORDON, D. **How dangerous is pentachlorophenol?** *Medical Journal of Australia, Sydney* Sept., 1956 (485–8). From *abstr.* in *Prev. Deterior. Abstr.* 16 (10), 1959 (*Fung.* 66). D.S.I.R.

Following the onset of symptoms of unusual illnesses after spraying work with PCP or its Na salt, 5 of the 9 male subjects observed died, 8 of them having shown fairly similar signs and symptoms. The ninth had a more chronic exposure to the fungicide over an extended period of working in a wood-treating operation. Notes are given on field exposure, clinical and autopsy details and on methods of protection with special clothing and masks (theoretically simple but often overlooked, especially in hot climates).

1086. BAECHLER, R. H. **Improving wood's durability through chemical modification.** *For. Prod. J.* 9 (5), 1959 (166–71).

Outlines research in progress at Madison to inhibit fungal growth in wood without the use of poisons by several different methods:—(1) Cyanoethylation, by adaptations of the process used with cotton. Complete resistance to *Lenzites trabea* was obtained by treating Pine sapwood to a retention of 0·95 lb./cu. ft. of acrylonitrile and 0·45 lb. of NH_3, then steaming for 2 hours at 15 lb./sq. in. (115° C.). Organic alkaline reagents plus the use of KI as a catalyst appear promising, and may make possible treatment without high temperatures (which involve strength losses), though at greater cost. Chemical modification corresponding to ca. 1% by weight of fixed N was needed to prevent attack. This is ca. ¼ of the amount corresponding to a complete conversion of the cellulose to its cyanoethyl ether. Certain evidence suggests, however, that the reaction may be reversible, through hydrolysis in the presence of much water. (2) The destruction of thiamine, a vitamin essential to most wood-rotting fungi. Exploratory tests were made with various alkaline substances in order to bring the pH of the wood to a point at which thiamine is destroyed. NH_3 content of 0·15 lb./cu. ft. imparted decay resistance to Pine or Gum sapwood if treatment was followed by 2 hours' steaming at 15 lb./sq. in. (3) The inactivation of trace elements essential to the fungi, including promising exploratory work with chelating agents.

1087. MCQUIRE, A. J., and WILSON, W. J. **An investigation into the oscillating pressure method for the impregnation of N.Z. grown timber.** *Interim Research Release (Forest Products), New Zealand Forest Service, Rotorua* No. 3, 1959. pp. 7.

The first stage of an investigation into this method of impregnation [see *F.A.* 18 No. 3434] has been completed, and results show that green-off-saw *Pinus radiata*, Douglas Fir and Corsican Pine can be successfully treated, giving complete sapwood penetration. For Douglas Fir and Corsican Pine, 14-hr. schedules are required, and 22-hr. for large structural *P. radiata*. Larch cannot be successfully treated in any moisture condition, and dry or part-dry Douglas is resistant to impregnation. The other species give good results both part-dry and dry. Further work is planned to confirm these results and compare the method with the normal vacuum/pressure process. *From authors' summary.*

1088. GILL, H. J., JR. **Treating Ponderosa Pine millwork by the vacuum process.** *For. Prod. J.* 9 (5), 1959 (149–53).

Describes the process and equipment developed for a 3-minute vacuum treatment of building components with PCP. Tests indicated that retention and penetration were greater, distribution within and between pieces more even, output greater and drying time less than with a 3-minute atmospheric dip. Sapwood sp. gr. was found to vary greatly, but without correlation with retention.

1089. PERKITNY, T., and GRECZYNSKI, T. Untersuchungen über die Spartränkung des Holzes mit wässrigen Salzlösungen und seine wirtschaftliche Rücktrocknung. **[Investigations on the impregnation of wood with water-soluble salt solutions by the Rueping process, and its economical re-drying.]** *Holz Roh- u. Werkstoff* 17 (7), 1959 (292–6). 2 refs. [G.g.e.] P.R.

Pilot experiments were made to show the influence of different operating pressures on the amount of solution taken up by the wood and expelled again. In the main experiments, the absorption of 2·7 and 27% Fluralsil solutions, and of the Fluralsil salt itself, was compared in Pine sapwood and heartwood treated by the (*a*) vacuum pressure, (*b*) pressure, and (*c*) Rueping-recovery methods. Ratios of the amounts of solutions retained after the release of pressure were 100:61:25, and after the final vacuum were 100:55:25 (*a*:*b*:*c*). The advantages of (*c*) in cases where the wood must be redried before use are discussed.

1090. KININMONTH, J. A. **The drying of Radiata Pine sawn timber pressure treated with water-borne preservatives.** *Tech. Pap. For. Res. Inst. N.Z. For. Serv.* No. 26, 1958. pp. 32. 6 refs.

The slow drying of *Pinus radiata* treated with aqueous preservative solutions by the full-cell process, is investigated. The possible causes of slow drying are examined and means of minimizing this trouble suggested. A direct comparison, using 4 × 2 and 4 × 1 in. timber, is made between the kiln-drying and air-seasoning rates of Radiata Pine treated with various liquids and untreated (green off the saw). The kiln-drying rates of boards treated with three multi-salt preservatives and with water are compared. It is deduced that slow drying is due primarily to pit aspiration or to some similar physical phenomenon, while the preservative chemical is a slight secondary cause of slow drying. A significant correlation is established between drying time and uptake of preservative solution, from which it is shown that if the uptake of preservative solution is restricted, the drying time can be reduced. Other aspects of the drying of treated Radiata Pine that are examined include the effect of a preliminary air seasoning of treated timber in reducing the kiln-drying time, and the development of steep moisture gradients during drying. *From author's summary.*

1091. AMEMIYA, S., and INOUE, M. **[Research for wood preserving treatment. (1) Temperature change in timbers heated and cooled with water solution of a preservative, and treating condition of hot and cold-bath treatment with the same solution.]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 106, 1958 (179–200). 16 refs. [Jap.jap.e.*e.*]

Presents thermocouple measurements on air-dry bolts of *Pinus densiflora*, 11–17 cm. in diam. (*d*) heated in a hot bath (90° C.) of 1·25% solution of Wolman salts and cooled (*a*) gradually in this bath, or (*b*) by transfer to a bath at room temperature. An approximately linear relationship was found between d^2 and the time required for any point $\frac{d}{x}$ from the surface of the bolt to reach a given temperature, and between the rate of temperature changes within the bolt and temperature differences between wood and bath. Penetration and retention were best when the wood was allowed to reach the bath temperature (6 hr. for 17-cm., and 3 hr. for 11-cm. bolts). With cooling time in (*b*) equal to heating time, retention was less than in (*a*) where cooling was slower, but if it was equally prolonged (to ca. 18 hr.) (*b*) appeared to be more effective. *From authors' summary.*

1092. BAECHLER, R. H., CONWAY, E., and ROTH, H. G. **Treating hardwood posts by the double-diffusion method.** *For. Prod. J.* 9 (7), 1959 (216–20). 2 refs.

Presents data for absorption and penetration of chemicals in green posts, mostly of 2½ to 5 in. diam., for various concentrations and immersion periods [cf. *F.A.* 19 No. 4913]. Total absorption was greatest in Tulip Tree, followed by Sweetgum, White and Red Oak, and Hickory, and only in Hickory was it less than in Loblolly Pine. Heating the first solution accelerated uptake and penetration. Penetration of ¾ in. was obtained with a one-day schedule for Tulip Tree and Sweetgum, but it was poor for Hickory and Oak (particularly in heartwood).

1093. GRAHAM, R. O., and WRIGHT, E. **Stronger spray cuts pole rot.** *Repr.* from *Electrical World, New York* 27 July, 1959. pp. 1.

Living decay fungi were found in the inner sapwood of > 70% of samples taken at 5 ft. above ground from Red Cedar poles near Portland, Ore., which had been basally sprayed with 5–6% PCP solution 15 or 25 years after erection, and 2 or 5 years before testing. Sapwood penetration was complete (ca. 0·7 in.) with a mean PCP content of 0·1 lb./cu. ft. Fungal growth occurred at retentions of 0·13 but not at 0·16 lb., and it is suggested that by raising the

spray concentration to 10%, a penetration of 0·16 lb. for the inner 0·2 in. of sapwood would be achieved.

1094 BAVENDAMM, W., and SCHNEIDER, W. Beiträge zur Holzschutztechnik.—Siebente Mitteilung: Praxisnahe Untersuchungen über die Imprägnierung von Bauholz durch Streichen und Trogtränkung mit Bifluoriden. [**Wood protection techniques—Report 7. Investigations, in conditions similar to practice, on the preservation of building timber by brushing-on and by soaking with bifluorides.**] *Holz Roh- u. Werkstoff* 17 (7), 1959 (284–91). 30 refs. [G.g.e.] P.R.

[Cf. *F.A.* 20 No. 3836.] Green and air-dry Pine and Spruce were treated by (*a*) brushing-on, and (*b*) trough-soaking, with 3 bifluorides at concentrations of 5, 10, 15 and 20%, and compared with wood treated with NaF. There were no significant differences in the behaviour of the 3 bifluorides. Absorption of the solution decreased slightly with increasing concentration, while the absorption of the preservative salt itself increased sharply. The volumes absorbed were greater with dry than with green wood, and greater with Pine than with Spruce. With dry Pine (*b*) was much better than (*a*), and with green, slightly better. Dry Spruce gave virtually the same results with (*a*) and (*b*). Green Spruce absorbed more from two brush applications than from 8 hours of (*b*). Penetration depth was greater with green wood than with dry, and the difference increased with increasing concentration. Penetration depths were greater for Pine sapwood than for Spruce, especially with (*b*). With the higher concentrations, penetrations of 10–18 mm. could be obtained on green and dry Pine and on green Spruce.

1095. BECKER, G., and BURO, A. Aufnahmen und Eindringtiefen beim Sprühen von Hausbockbekämpfungsmitteln. [**Absorption and depth of penetration in spraying to control *Hylotrupes bajulus*.**] *Holz Roh- u. Werkstoff* 17 (7), 1959 (268–80). 16 refs. [G.g.e.] P.R.

One water-soluble and 10 oily preservatives were sprayed on to infested and uninfested Pine and Spruce wood. Surface roughness had the greatest influence on absorption in uninfested wood, e.g. frame-sawn timber absorbed 150–250% more than planed timber. After spraying to run-off, Pine absorbed 25% more preservatives than Spruce. In uninfested wood, absorption of (*a*) oily preservatives was ca. 200–350, of (*b*) 20% HF solution ca. 150, and of (*c*) water ca. 250 c.c./sq. m. Films of wood 0·6 mm. thick over *H. bajulus* bore-dust (corresponding to tunnels close to the surface) did not absorb significantly more than thicker sheets of wood, but open tunnels did increase absorption. In wood having 50% of its surface damaged by tunnels, absorption of (*a*) rose 3- to 4-fold, of (*b*) 1·5-fold, and of (*c*) 2-fold. Penetration depth of (*a*) in sound Pine was 4–7 mm., and in sound Spruce 1–3 mm.; of (*b*), 6 and 4 mm. respectively. In wood with 50% of its surface damaged, (*b*) penetrated to 5–6 mm., or, if the wood was wetted twice after spraying, to 8 mm. With (*a*) penetration ranged from 4 to 19 mm. The relative advantages of (*a*) and (*b*) are discussed.

1096. THEDEN, G., and BUCHMANN, C. Zur Frage der chemischen Hausbockbekämpfung bei vorhandenen Kalkanstrich. [**Chemical control of *Hylotrupes bajulus* in wood brush-treated with lime.**] *Holz Roh- u. Werkstoff* 17 (7), 1959 (281–4). 4 refs. [G.g.e.] P.R.

Investigations showed that there was some penetration of CaO into wood from coats of lime applied to wood as fire-retardants, and that this impeded the penetration of preservatives for the control of *H. bajulus*, even after removal of the lime coating. Careful operation and the use of additional amounts of water-borne preservatives can overcome these effects.

1097. GROVER, P. N. **Protection against water absorption and decay of timber logs used for booms.** *Journal of the Timber Dryers' and Preservers' Association of India, Dehra Dun* 4 (3), 1958 (11–4). From *abstr.* in *Prev. Deterior. Abstr.* 16 (7), 1959 (*Wood* 71). D.S.I.R.

Specimens of rectangular cross-section of Deodar (*Cedrus deodara*) and Kail (*Pinus excelsa*), containing mainly heartwood, were creosoted by the full-cell process, air dried, and exposed to water under pressure. Water absorption of untreated Kail averaged about 60% in 5 hr., compared with 3·4% for the creosoted specimens, and 1·6% for creosoted ones painted with 'Tar Stil' (a bituminous paint). Corresponding figures for Deodar were 44, 3·2 and 1·8% respectively, the lower absorption perhaps being due to natural oil present in the wood. Both species, when treated with creosote plus paint, can be expected to give satisfactory service as booms, and as an additional safety measure the timbers can be lifted every 3–5 years and repainted with 'Tar Stil'.

1098. NISHIMOTO, K., and INOU(Y)E, Y. [**Methods for testing the effectiveness of preservatives. I. On the process for weathering of preservatives with weather meter. (1).**] *Wood Res., Kyoto* No. 20, 1959 (55–74). 31 refs. [Jap.e.*e.*]

Describes tests made to compare the effects of normal and artificial weathering on test blocks of *Cryptomeria japonica* and *Fagus crenata* sapwood treated with 8 preservatives. Preservative loss was determined both by chemical analysis and decay resistance, submitting the blocks to tests using *Poria vaporaria*. Tables indicating the effective values of the preservatives are given.

1099. KAL'NIN, M. M. Dlitel'nye issledovanija éffektivnosti antiseptikov. [**Long-term investigations on the efficiency of preservatives.**] *Lesn. Prom.* 1959 (6), (20–1). [Russ.russ.]

An account of experience in Latvia with Pine telegraph poles, impregnated in 1924 by a diffusion process, using the Na arsenates Dipon A (Latvian) and Osmolit UA (German) at 5 kg./cu.m. wood, each pole being capped with a perforated metal plate fastened over a pad soaked with the preservative paste. After 34 years, ca. 50% of the poles are still in service. Poles treated by the Boucherie process with Tanalith UA have not lasted so well, showing decay especially at the top and at the cross-arms. Bandage treatment with Tanalith UA (German) and

Dipon A was not very effective. Poles treated by capping with supplementary bandaging showed no decay after 17 years. Creosote applied at 6 atm. pressure gave the best results, > 50% of the poles so treated being still in service after 34 years. A single treatment with NaF solution at 6 atm. pressure, gave very poor results, as did diffusion treatments with NaF (5 kg./cu.m. wood).

842. Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies

1100. Goto, T., *et al.* **[Studies on the dimensional stabilization of wood. II. Treatment with formaldehyde under inorganic acid catalysts. III. Treatment with formaldehyde under organic acid catalysts. IV. Treatment with formaldehyde under inorganic salt catalysts.]** *Wood Res., Kyoto* No. 20, 1958 (1–36). 13 refs. [Jap.e.*e.*]

[Cf. *F.A.* 20 No. 2481.] (II) Studies the effects of formaldehyde on the dimensional stability (d.s.) of specimens of *Chamaecyparis obtusa* and *Betula nikoensis* (5 × 1 cm. cross-section, 0·5 cm. long) pretreated with HCl and H_3BO_3 as catalysts. (III) Similar studies but using formic, oxalic and *p*-toluene-sulphonic acids as catalysts. The specimens were pretreated by soaking in 1% formic acid, 2% oxalic acid, or 1% *p*-toluene-sulphonic acid solution for 14 days at 5–10° C., then air-dried, and conditioned at 15° C. and 65% r.h. for 40 days. (IV) As (III), but substituting 1–8% $ZnCl_2$ or 2% $CaCl_2$ in the pretreatment. Detailed results of (II)–(IV) are tabulated in English.

1101. Araki, M., *et al.* **[Studies on the dimensional stabilization of woods. (VI). Effects of reaction temperature and period to the formaldehyde treatment of woods under HCl catalyst.]** *Wood Res., Kyoto* No. 21, 1958 (51–60). 3 refs. [Jap.e.*e.*]

Describes experiments made on specimens of *Chamaecyparis obtusa* and *Betula nikoensis* to ascertain the effect of the reaction temperature and duration of formaldehyde treatment with HCl catalyst on the hygroscopicity (h.) and dimensional stability (d.s.) of wood. Results indicate maximum improvement in h. and d.s. for treatment with HCl catalyst at 95° C. for 7–10 hours.

844. Attack by Plant Organisms

844.1. Sap-staining and Mould Fungi

See also Nos. 764, 766, 1064, 1150.

1102. Francke-Grosmann, H. Über die Ambrosiazucht holzbrütender Ipiden im Hinblick auf das System. **[The ambrosia cultures of wood-inhabiting Ipidae in relation to taxonomy.]** *Repr.* from *Verhandlungsbericht der Deutschen Gesellschaft für Angewandte Entomologie, Hamburg und Berlin* No. 14, 1957 (1958), (139–44). 4 refs. [G.]

Describes the localization and morphology of the organs which secure overwintering of the ambrosia fungi and their transfer to the next generation, in beetles of the genera *Trypodendron* (Xyloterini) and *Xyleborus, Xyleborinus, Xylosandrus, Anisandrus* and *Eccoptérus* (Xyleborini), and also the differences and affinities of the fungi involved, with special reference to taxonomic relationships.

844.2. Wood-destroying Fungi

See also Nos. 138, 528, 629–36, 717, 765, 944, 1084, 1086, 1126, 1150.

1103. **Culture collection.** *Extr.* from *Rep. Dir. For. Prod. Res. Bd., Lond. 1958*, 1959 (29).

Recognizable fruit bodies have been obtained in 13 out of 22 basidiomycetes examined, by using the technique described in *F.A.* 19 No. 3559. Use of this method has permitted the identification of the hitherto sterile fungus associated with the Alder wood-wasp (*Xiphydria camelus*) as *Daldinia concentrica.*

1104. Waldrop, F. B., Day, J. R., and Kite, H. T. **The deterioration of Redwood cooling tower lumber.** *Research & Development Report, Technical Information Service, U.S. Atomic Energy Commission, Oak Ridge, Tenn.* No. Y-1156, 1957. pp. 38. From *abstr.* in *Prev. Deterior. Abstr.* 16 (10), 1959 (*Wood* 96). D.S.I.R.

Discusses chemical and microbiological deterioration of cooling-tower timber, and reports results of an investigation of the wood. Details are given of various pretreatments and *in situ* measures carried out. Periodic inspections are recommended.

1105. Armstrong, F. H., and Savory, J. G. **The influence of fungal decay on the properties of timber. Effect of progressive decay by the soft rot fungus, *Chaetomium globosum*, on the strength of Beech.** *Holzforschung, Berlin* 13 (3), 1959 (84–9). 14 refs. [E.e.g.] P.R.

[Cf. *F.A.* 20 No. 2491.] Soft rot caused a sharp decrease in total work (energy absorbed to total fracture in bending) before significant weight losses occurred in the wood. Reduction in ultimate bending strength was more gradual and was not significant until definite weight losses were evident. Soft rot is more closely comparable to a white than a brown rot in its effect upon the impact resistance of wood. *From authors' summary.*

1106. Kohlmeyer, J. **Wood-destroying fungi in sea-water.** *Transl. For. Prod. Lab. Can.* No. 129, 1959. pp. 10. 23 refs. Transl. from *Holz Roh- u. Werkstoff* 16 6), 1958 (215–20). [See *F.A.* 20 No. 1156.] Limited distribution.

1107. Soshiroda, S., and Kamiyama, K. **[Studies on the deterioration and preservation of wood piles.]** *Wood Ind., Tokyo* 14 (7), 1959 (14–8). [Jap.e.] P.R.

As the result of a survey of termite and fungal attack on wooden foundation piles, the following observations were made: (1) no attack was found below the ground-water level; (2) above this, the extent of attack increased in proportion to the porosity of the soil round the piles.

1108. Czaja, A. T. Über das Aufkommen des echten Hausschwammes (*Merulius lacrymans* var. *domesticus* [Pers.] Falck) und des braunen Kellerschwammes (*Coniophora cerebella* [Pers.] Duby) aus ihren Sporen an verbautem Holz. **[The development of *M. lacrymans* var. *domesticus* and *C. cerebella* from their spores in wood in buildings.]** *Angew. Bot.* 33 (3), 1959 (107–21). 22 refs. [G.] E.M.B.

Experiments in the germination of spores of *M.*

lacrymans and *C. cerebella* and a review of work on manner of infection led to the following conclusions. Spores of *M. lacrymans* remain viable for a longer period than previously assumed. Germination is induced by very small concentrations of water-soluble vitamins of the B_1 group in mixture with small concentrations of organic acids of the Krebs-Martins (citric acid) cycle. Spores of *C. cerebella*, when stored dry for several months and unable to germinate on the usual culture media, will germinate on the same culture medium as *M. lacrymans*. The substances necessary to germination can be released in structural timbers by the action of stain, mould and other fungi, and also enzymes. The fact that dry rot occurs mainly in old buildings is partly due to the fact that new timber contains certain inhibiting substances, and partly because the substances assisting germination develop with time. It is not necessarily mycelia of *M. lacrymans* that act as a source of infection; a single viable spore can serve under favourable conditions. The importance is emphasized of protecting wood against organisms producing these conditions. [Cf. *F.A.* 20 No. 5265.]

1109. GOKSØYR, J., and KLUNGSØYR, L. **Phosphate compounds in respiring mycelium of *Merulius lacrymans* (Jacq.) Fr.** *Acta chem. scand.* 13 (3), 1959 (497–501). 5 refs. [E.e.] O.R.S.

Experiments show that the fungus contains a system for generating energy-rich phosphate bonds operating during active respiration, with adenosine triphosphate as their main store. The phosphate metabolism does not seem to differ much from that of other micro-organisms.

1110. SISON, B. C., JR., and SCHUBERT, W. J. **On the mechanism of enzyme action. LXVIII. The cellobiase component of the cellulolytic enzyme system of *Poria vaillantii*.** *Arch. Biochem.* 78 (2), 1958 (563–72). 22 refs. O.R.S. [Cf. *F.A.* 20 No. 1160.]

1111. SHIMAZONO, H. **Investigations on lignins and lignification. XXI. Identification of phenolic esters in the culture medium of *Lentinus lepideus* and the *O*-methylation of methyl-*p*-coumarate to methyl *p*-methoxycinnamate *in vivo*.** *Arch. Biochem.* 83 (1), 1959 (206–15). 8 refs. O.R.S.

1112. LYR, H., ZIEGLER, H., and HEFFE, C. Enzymausscheidung und Holzabbau durch *Phellinus igniarius* Quél. und *Collybia velutipes* Curt. **[Enzyme liberation and wood decomposition by *Fomes igniarius* and *C. velutipes*.]** *Phytopath. Z.* 35 (2), 1959 (173–200). 61 refs. [G.g.e.] O.R.S.

Rotting of Beech and the formation of ecto-enzymes by the two fungi, mycelium formation and the changes in the culture filtrate, were studied for 212 days. The wood is attacked polyenzymatically. Ectoenzymes found for *F. igniarius* were peroxidase, laccase, cellulose, pectinase, pectase, amylase and proteinase. No trace could be found in culture filtrates of either fungus of cellobiase, saccharase, glucose oxidase and other sugar oxidases, α-hydroxy-acid-oxidase, oxalic-acid-oxidase, phosphoresterase, or orthophosphate-trans-glucosidases. The greatest enzyme activity was found in the first 70 days of attack, when mycelium formation and wood-rotting were slight, enzyme activity decreasing with increasing mycelial development and the appearance of decomposition products. *C. velutipes*, with lower enzyme activity, caused less decomposition than *P. igniarius*. Decomposition of lignin and a corresponding high activity of peroxidase and laccase were considerably higher for *P. igniarius*. Both fungi caused a clear increase of alkali-soluble substances at the beginning, soon changing to a decrease as a result of decomposition of these substances. In *C. velutipes* a rise in the pentosan values was observed at the beginning of the attack. The decomposition of the cellulose by both fungi occurs concurrently with the decomposition of the other wood constituents. No preferential decomposition of lignin was observed.

1113. LYR, H., and ZIEGLER, H. Die Wirkung von Pentachlorphenol auf den Stoffwechsel höherer Pilze. **[The effect of PCP on the metabolism of higher fungi.]** *Phytopath Z.* 36 (2), 1959 (146–62). 38 refs. [G.g.e.] O.R.S.

Collybia velutipes proved more susceptible than *Trametes versicolor*, *Fomes igniarius* and *Fomes marginatus*. The action of the poison, broadly the same for all fungi, caused a characteristic alteration of individual phosphate fractions, leading to secretion of P, reduction of the dry matter of the mycelium combined with secretion of N, and inhibition of sugar resorption. Effects are discussed in detail.

1114. GERSONDE, M. **Toxic sensitivity of different strains of wood-destroying fungi.** *Transl. For. Prod. Lab. Can.* No. 128, 1959. pp. 10. Transl. from *Holz Roh- u. Werkstoff* 16 (6), 1958 (221–6). [See *F.A.* 20 No. 1161.] Limited distribution.

1115. CHOU, S.-H., CHOU, K.-H., and CHI, C.-T. **[Experiments on the use of chemicals to control insect and fungus pests in log dumps.]** *For. Sci., Peking* 1959 (4), (327–35). 9 refs. [Chin.russ.]

Experiments have been made in protecting (*a*) *Pinus koraiensis* and *Picea obovata* logs from insect attack by spraying, and (*b*) logs of *Betula platyphylla* from fungus attack by coating the sawn ends. In (*a*), sprays of 5% Na_3AsO_3, 4% NaF, and 3 or 5% DDT proved very effective. In (*b*), Birch tar + $ZnCl_2$ or NaF, and diluted pastes of clay + $ZnCl_2$ or NaF, were effective.

1116. COSTA, E. W. B. DA, and APLIN, T. E. H. **Project P.13. The natural durability of timber. Sub-project P.13–5. The comparative resistance of timber species to decay in accelerated laboratory tests. Progress Report No. 2. The resistance to decay in laboratory tests of twenty-three durable or moderately durable Australian timbers.** Division of Forest Products, C.S.I.R.O., Melbourne. 1959. pp. 17. 6 refs.

Soil-block methods, with 8 fungi, were used to test durability of 19 *Eucalyptus* spp., *Syncarpia laurifolia*, *S. hillii*, *Tristania suaveolens*, *T. conferta*, *Quercus alba* and *Pseudotsuga taxifolia*. *S. laurifolia* and *E. cloeziana* were the most and *Q. alba* and *P. taxifolia* the least resistant.

1117. OPSAL, P. M., and HOSSFELD, R. L. **The nature and significance of the natural durability of diamond Willow heartwood.** *For. Prod. J.* 9 (6), 1959 (188–91). 15 refs.

In soil-block decay tests of the heartwood of *Salix eriocephala* (*a*) and *S. discolor* (*b*) from stems exhibiting diamond-shaped cankers (whose timber is found to be more durable than that of normal Willow), (*a*) lost 17% of weight and (*b*) 30%, compared with 50% for Aspen sapwood used as a standard. Water and alcohol extractives of (*a*) separated by ion-exchange and paper chromatography techniques, were markedly toxic to fungi. [Cf. *F.A.* 19 No. 2446.]

1118. KÜHLWEIN, H. Über ein mikrobiell abgebautes Holz von *Drimys winteri.* **[Wood of *D. winteri* decomposed by microbial action.]** *Ber. Dtsch. Bot. Ges.* 72 (5/6), 1959 (188–90 + 1 plate). 10 refs. [G.g.] O.B.D.

Rot of the type called *palo podrido* in Chile reduces wood to a pasty mass of a yellow-brown to light grey colour, and is caused by microbial decomposition. Wood of *D. winteri* encountered in Chile in this state was found to contain membranes of the bordered pits still intact. It is suggested that their resistance to decay is due to a high mineral content.

1119. PANĂ, G. I. Cercetări asupra lemnului alterat de răşinoase şi a produselor obţinate din el. **[Studies on decayed wood of conifers and products obtained from it.]** *Industr. Lemn.* 7 (4), 1958 (123–7). 5 refs. [Rum.russ.g.f.e.]

Gives a classification of Spruce wood into 4 degrees of decay; the results of tests of physical and mechanical properties for the decayed wood and for fibreboard made from it; nail- and screw-holding properties of decayed and undecayed wood; and saw tooth, angle etc. for sawing decayed wood.

1120. MAŠIREVIĆ, Đ. Natrulo drvo kao sirovina za proizvodnju celuloze. **[Wood attacked by rot fungi as raw material for cellulose production.]** *Šumarstvo* 11 (9/12), 1958 (589–96). 4 refs. [Serb.e.f.]

Tabulates some figures from laboratory experiments to show the decreases in holocellulose content and in sulphate pulp yield of samples of Pine, Silver Fir and Spruce wood from different regions of Jugoslavia, in various stages of decay, mostly by a 'red rot' [stages of decay not specified in detail, and fungus species not indicated]. The attacked wood was less readily penetrated by the cooking liquor than samples of sound wood. Mechanical properties of sulphate pulp from the attacked wood were, however, practically the same as those of pulp from the sound samples.

845.1. Marine Borers

1121. **Marine borers.** *Extr.* from *Rep. For. Dep. Tanganyika 1958*, 1959 (21).

A combined operation by the Kenya and Tanganyika Forest Departments and E. African Railways and Harbours Administration is in progress. *Martesia striata* was the commonest and most vigorous borer. No timber was resistant, creosoting was ineffective, and only preservatives with heavy concentrations of Cu proved satisfactory. It was estimated that the most resistant, naturally durable timbers had an expectation of life of only 8 years.

1122. SRINIVASAN, V. V. **Two species of wood-boring pholads of Madras.** *Proc. Indian Acad. Sci.* 50*B* (2), 1959 (105–11). 25 refs. O.R.S.

Descriptions and notes on the occurrence of *Martesia striata* and *M. fragilis.*

1123. WHELLAN, J. A. **Report of the chief entomologist for the year ended 30th September, 1957. Wood boring insects.** *Rhod. agric. J.* 56 (3), 1959 (118). E.M.B.

Nymphs of *Povilla adusta* were found to have damaged jetty supports at Lake McIlwaine, by boring, though not sufficiently to cause alarm. Damage to the thinner timber of boats, however, can be serious. [Cf. *F.A.* 18 No. 4705.]

845.2. Terrestrial Borers

See also Nos. 700, 752, 764–6, 768–9, 1044, 1083–4, 1095–6, 1102–3, 1115.

1124. DOMINIK, J. Uwagi o owadach niszczących drewniane urządzenia wodne. **[Insects destroying timber structures on water.]** *Sylwan* 103 (4), 1959 (49–52). [Pol.russ.e.]

Briefly describes the main pests attacking bridges etc. on the Lodz plateau and in the Vistula basin. Chief of these were: for structures under water, *Glyptotendipes gripekoveni*; for woodwork at water level, *Nacerda melanura*; 20 or 30 cm. above water level—(*a*) in contact with the ground, *Leptura rubra* and species of Cossoninae,and (*b*) without ground contact, *Hylotrupes bajulus*, *Anobium* spp., and *Ptilinus pectinicornis. From author's summary.*

1125. DOMINIK, J. Uwagi o występowaniu spuszczela (*Hylotrupes bajulus* L.) (Cerambycidae Col.) w północno-wschodniej części Wyżyny Łodzkiej. **[The occurrence of *H. bajulus* in the north-eastern part of the Lodz Plateau.]** *Sylwan* 103 (4), 1959 (41–7). 13 refs. [Pol.russ.e.]

Nearly all wooden dwellings in the area were found to be infested, one of the main causes being re-use of infested timber from demolished buildings. Carbolineum applied to walls of standing buildings gave no protection. *From author's summary.*

1126. BLETCHLY, J. D. **Soft rot in Beech—its influence on furniture beetle [*Anobium punctatum*] attack.** *Timb. Technol.* 67 (2241), 1959 (295, 297–9).

In continued work [cf. *F.A.* 15 No. 854], samples of Beech sprayed with a spore suspension of *Chaetomium globosum* were used. Results indicated that soft-rotted wood may allow greater larval survival, faster larval growth and possibly greater ease of initial larval penetration than white- or brown-rotted wood. These findings are compared with those of Fisher [see *F.A.* 2, p. 304; 3, p. 223].

1127. BEHRENZ, W., and TECHNAU, G. Versuche zur Bekämpfung von *Anobium punctatum* mit Symbionticiden. **[Experiments in the control of *A. punctatum* with 'symbionticides'.]** *Z. angew. Ent.* 44 (1), 1959 (22–8). 10 refs. [G.g.e.] O.H.

The authors discuss the potential advantages of

methods—e.g. high selectivity—that aim at destroying microorganisms on which the pests concerned depend for their metabolism, by antibiotics or similar substances, citing experiments with termites and other insects, and describe their own experiments with a number of substances used to impregnate Alder and Pine wood on which *A. punctatum* larvae were reared, in an effort to destroy the yeast cells living as essential symbionts in the walls of their guts. Of these, 4-aminobenzole sulphonamide caused marked deformation in the yeast cells, and a dosage of 2·6 kg./cu.m. wood eliminated the symbionts of medium-sized larvae in 6 months, causing the larvae to die some time later. Smaller retentions acted more slowly. The method is thought to be of interest as a non-toxic protection of valuable furniture etc.

1128. WRIGHT, C. G. **Biology and control of the southern *Lyctus* beetle, *Lyctus planicollis* Leconte (Coleoptera, Lyctidae).** *Abstr. of thesis*, in *Dissert. Abstr.* 19 (11), 1959 (3064–5). O.R.S.

Methods were developed for securing numbers of eggs and small larvae, observation of first- and second-instar larvae, and collection of prepupae and pupae in mass. A prepupal stage was reported for the first time. The influence of various factors on development over a 38-week period was studied: Red Oak and air-dried wood produced more beetles than White Oak and heat-dried wood respectively; the effect of light on adult emergence was inconclusive; the shortest observed time between exposure of uninfested wood to adults and collection of a newly emerged ♂ and ♀ was 69 and 68 days in air- and heat-dried Red Oak respectively. A 'wood-shavings technique' was used for study of egg development, wood shavings giving a satisfactory oviposition site. Egg and larval development, sex ratio, duration of adult life, mating and oviposition were studied in detail. Complete control of laboratory-induced infestations in half-round and triangular wood samples was secured by soaking in 2% chlordane and 0·5% dieldrin. Wood samples soaked in emulsions of the inert ingredients of both the chlordane and dieldrin emulsions produced few adults, whereas those soaked in water or left untreated yielded large quantities. A direct correlation was found between the number of adults collected and the weight loss of the wood.

1129. DESCHIENS, R., and COSTE, C. **The protection of works of art in carved wood from the attacks of wood - eating insects.** *Museum (U.N.E.S.C.O.), Paris* 10 (1), 1957 (55–9). [F.?] From *abstr.* in *Prev. Deterior. Abstr.* 16 (10), 1959 (*Wood* 102). D.S.I.R.

Describes species and characteristics of the insects concerned (mainly Anobiidae, Lyctidae and Cerambycidae), and gives detailed instructions for killing existing infestations and preventing their recurrence.

1130. JONES, T. **The major insect pests of timber and lumber in West Africa.** *Tech. Bull. W. Afr. Timb. Borer Res. Unit* No. 1, 1959. pp. 20 + 15 photos. 8 refs.

Deals with ambrosia, longhorn and powder-post beetles, timber attacked and the nature of the damage, preventive measures and their toxic hazards.

1131. JONES, T. **Ambrosia beetles (Scolytoidea), their biology and control in West Africa.** *Tech. Bull. W. Afr. Timb. Borer Res. Unit* No. 2, 1959. pp. 14 + 9 photos. 8 refs. [Cf. *F.A.* 20 Nos. 4929, 5273–4.]

1132. PRENTICE, R. M., and CAMPBELL, A. E. **Volume loss of pulpwood in Manitoba caused by wood borers.** *For. Chron.* 35 (2), 1959 (142–5). 2 refs.

Measurements were made of the volume losses caused by wood borers in Jack Pine and Black Spruce pulpwood exposed to attack during the summer of 1956 in Manitoba. The average number of borer holes per sq. ft. of log surface was 4·8 in Jack Pine and 6·5 in Black Spruce. Losses due to surface feeding and tunnelling were low and seldom exceeded 1·5% of the volume of sample logs. These losses would not have offset the cost of chemical control. Cerambycid larvae accounted for most of the volume loss. Losses caused by buprestids were insignificant. *Authors' summary.*

845.3. Termites

See also Nos. 1084, 1107, 1171–2.

1133. ERNST, E. Der Einfluss von Luftfeuchtigkeit auf Lebensdauer und Verhalten verschiedener Termitenarten. **[The effect of atmospheric humidity on the life span and behaviour of various termite species.]** *Acta Tropica, Basel* 14 (2), 1957 (97–156). 100 refs. [G.g.f.e.] I.I.E.

All 4 species tested survived longest in a very humid atmosphere. Survival in a dry atmosphere, and time taken in seeking a more humid spot in a humidity gradient, corresponded roughly to the moisture conditions of their habitat, namely, in descending order: *Kalotermes flavicollis, Zootermopsis nevadensis, Reticulitermes lucifugus*, and *Nasutitermes lucifugus. From author's summary.*

1134. LUND, H. O. **Tests of the ability of *Reticulitermes flavipes* (Kollar) to build tubes over Pine wood chemically treated for rot control.** *J. econ. Ent.* 52 (3), 1959 (533–4).

Experiments demonstrated that this termite can, in some circumstances at least, build tubes over lumber treated with some of the common wood preservatives.

1135. LUND, A. E. **Douglas Fir plywood: its treated and natural resistance to termites.** *For. Prod. J.* 9 (7), 1959 (220–4). 8 refs.

In laboratory experiments with treated [preservatives not specified] and untreated test blocks, all showed some evidence of attack by the test species, *Reticulitermes virginicus.* Volume losses were, however, much greater for the untreated series (4% in 25 days) controverting the claim of termite-resistance made for Douglas Fir. [Cf. *F.A.* 19 No. 2430.]

846. Steaming

See Nos. 907, 974.

847. Drying (Seasoning)

See also Nos. 974, 1066, 1089–90.

1136. KRPAN, J. Istraživanje prirodnog sušenje ogrjevnog drva. [**Studies on the air seasoning of fuelwood.**] *Drvna Ind.* 9 (11/12), 1958 (154–64). [Croat.e.] P.R.

Oak, Ash, Elm, Alder and Poplar (*Populus alba*) cordwood was stored as split billets, and Oak in bolts also, from April 1957 to April 1958, (*a*) near the stump in the forest and (*b*) at a loading depot in a clearing. Data on ring width, sp. gr., moisture content of heartwood and sapwood, and rate of drying, are presented, analysed statistically and discussed. At (*b*) except for Oak bolts and Poplar, the wood reached equilibrium m.c. within 4–5 months, at a m.c. of $< 25\%$, which is a safe limit against fungus attack. At (*a*), m.c. of all species except Ash was 25% after one year. The moisture losses per cu.m. stacked wood per day at both sites are calculated.

1137. HATTORI, M. **Air-seasoning Japanese Cedar poles for creosote treatment.** *J. Jap. Wood Res. Soc.* 5 (3), 1959 (108–10). [E.] P.R.

About 6 months appeared to be the optimum period for air-seasoning *Cryptomeria japonica* poles for creosoting in Japanese timber yards, longer periods showing very little additional m.c. reduction and considerable pole failure. Sufficient m.c. reduction is obtained after 1 month but creosote penetration of the sapwood is poor. [Cf. *F.A.* 20 No. 1142.]

1138. DUMITRESCU-GÎRBOVI, S. Cîteva date privind variaţia umidităţii lemnului la cheresteaua de răşinoase stivuită pentru uscare îm aer liber. [**Variations in moisture content in softwood lumber stacked in the open.**] *Industr. Lemn.* 7 (4), 1958 (127–31). [Rum.russ.g.f.e.]

Gives (in tables and graphs) experimental data on variations in m.c. for lumber of different dimensions and different initial m.c., stacked for different periods and at different seasons of the year.

1139. PECK, E. C. **Air drying 4/4 Red Oak in Southern Wisconsin.** *For. Prod. J.* 9 (7), 1959 (236–42).

Describes tests in an industrial yard 25 miles N.W. of Madison. Drying time to 20% m.c. varied from 65 days for stacks started in May to 212 for September stacks. No well dried stock was available from late Oct. to early May. Degrade was generally slight. Roofing was considered economical in reducing it, but inclined stacking was not.

1140. **Research in forced-air drying of lumber.** *Extr.* from *Rep. Stheast. For. Exp. Sta. 1958*, 1959 (7–10).

In trials with pre-driers using air velocities (a.v.) of 200–1000 ft./min., 1-in. Pine lumber was dried from ca. 95 to ca. 18% m.c. at a constant 80° F. in 4–8 days depending on a.v. and outside weather. In trials in unheated wind tunnels at a.v. of 300–800 ft./min., drying took 12–7 days in winter, 7·4–4·3 days in spring. The most economical a.v. (taking into account power consumption) was 500–600 ft./min. [Also reported in *For. Prod. J.* 9 (5), 1959 (23*A*–26*A*).] When green Pine was dried without heat at 500 ft./min. (outside temperature 76° F. and r.h. 84%) in a 16-ft. tunnel, drying time to 30% m.c. was 5, 11, and 14 days for the samples at the entrance, centre and exit of the tunnel respectively, and the exit lot developed blue-stain, pointing to the importance of the distance travelled by air and the desirability of reversing the current. A pre-drying technique, based on control of equilibrium m.c. (at 9 to 11%) rather than temperature, gave good results at lower costs for 1-in. and 2-in. Pine and some hardwoods, though some surface checking occurred.

1141. RICE, W. W. **Use a stacking jig for better lumber packages.** *Sta. Note Cent. St. For. Exp. Sta.* No. 131, 1959. pp. [4].

The jig (illustrated) assures vertical sticker alignment and uniform stack dimensions with no increase in stacking time, and can be used in both air- and kiln-drying.

1142. HYLER, J. E. **Modern sawmilling. Parts 120–125.** *Sth. Lumberm.* 199 (2478–2483), 1959 (31 . . . 40; 35 . . . 42; 37 . . . 45; 31 . . . 35; 33 . . . 40; 33 . . . 40).

Progressive kilns, pre-drying, auxiliary equipment (e.g. respirators with heat exchange cartridges, and aluminized asbestos clothing for kiln workers) and control apparatus, remanufacturing machines, planers and matchers.

1143. ATTIWELL, P. **Kiln drying of Monterey Pine.** *For. tech. Pap. For. Comm. Vict.* No. 1, 1959 (17–9 + 2 gphs.).

A preliminary investigation on the use of superheated steam in the kiln-drying of *Pinus radiata* gave promising results, reducing drying time without serious degrade.

1144. **The kiln drying of Obeche.** *Extr.* from *Rep. Dir. For. Prod. Res., Lond. 1958*, 1959 (7).

Miniature kiln tests to study the effect, on drying rate and final condition of $1\frac{1}{8}$-in. *Triplochiton scleroxylon* boards, of using lower humidities than formerly held necessary, indicated that exposure to 5% humidity caused no appreciable degrade, and less shrinkage, and gave a brighter final appearance. It is suggested that, for commercial drying, a full-sized load could be dried in 2 days (without modifying ventilation arrangements) if treated in a good reversible forced-draught kiln with inlet air conditions of 180° F. and ca. 15% r.h.

1145. CORTES, R. T., and KAUMAN, W. G. **Project S.5. Progress report No. 6. Experiment S.5/22. Effect of partial or complete replacement of water with various liquids on the intensity of collapse in *Eucalyptus regnans*.** Division of Forest Products, C.S.I.R.O., Melbourne. 1959. pp. 9. 4 refs. Limited distribution.

In order to investigate the possibility of reducing collapse by partially or completely replacing water in the wood by liquids of lower surface tension, a batch of $\frac{5}{8}$-in. cubes from 6 *E. regnans* trees was immersed for 1 week in various liquids and dried at

110° F. and 60% r.h. for 3 days, reconditioned for 2 hr., then allowed to reach equilibrium at 70° and 63% r.h. and finally oven-dried to constant weight at 220°. Significantly less re-collapse occurred in a second batch of specimens that was first air-dried to 12% m.c., then reconditioned, oven-dried at 140°, and finally immersed in liquids of lower surface tensions than water, than in water-treated controls, immersed green specimens showing no reduction in collapse. Immersion in 0·03*N* HCl was without effect but immersion in 0·04*N* NaOH and in formamide increased shrinkage significantly.

848. Timberyard Practice. Handling and Storage of Timber

See also Nos. 812, 889, 1020, 1058–9, 1166–7.

1146. SOINÉ, H. Das Förderwesen in der Holzindustrie—erste Mitteilung: Gleislose Flurfördermittel—Gabelstapler. [**Transport systems in the woodworking industry. Part I. Trackless transport—fork-lift trucks.**] *Holz Roh- u. Werkstoff* 17 (8), 1959 (327–33). [G.g.e.] P.R.

Discusses different types of truck and their uses in mills and timber yards, giving photographs of a number of German models.

1147. BEKKER, I. G. Novyj avtolesovoz T-80. [**The new T-80 straddle-carrier.**] *Lesn. Prom.* 1959 (6), (8–11). [Russ.]

Describes, with drawings and specifications, a conventional, hydraulically operated machine which can pick up and transport between its wheels up to 5000 kg. of sawn timber. Ground clearance (empty) is 1750, track width 1250, and wheelbase 3400 mm.

1148. PUTKISTO, K. Sahatukkien tuumalajittelu maavarastossa haarukkatrukilla. [**Sorting of sawlogs by fork-lift truck in land storage.**] *Pap. ja Puu* 41 (7), 1959 (337–44). 2 refs. [Fi.fi.e.*e.*] P.R.

An area of ca. 77 × 27 m. will be needed for sorting and storing for a mill using 3000 cu. ft./day. A crew consisting of the fork-lift driver and 2 sorters is needed. Studies by Metsäteho at Inkeroinen showed that factors affecting output are the skill of the workers, the number of 1-in. diameter classes, distribution of logs by diam. classes, mean size of logs, the number of log layers in the unsorted stack, the size of the sorting area, the smoothness and firmness of the ground and the chance grouping of logs in the unsorted stacks. At Inkeroinen, output ranged from 74 to 80 logs for Pine and 60 to 65 for Spruce, or 400 to 440 cu. ft./hr. Operating costs are discussed. *From author's summary.*

1149. **Economics of bundling sawn timber for transport.** *Aust. Timb. J.* 25 (4), 1959 (14 . . . 24).

A study by the Commonwealth Forestry and Timber Bureau showed that bundling sawn timber effected a saving per 100 super ft. of 4*s.* for freight, 1*s.* for delivery to ship and 3*s.* for delivery from ship. Sorting to uniform size before bundling saved 6*s.* 9*d.*/100 super ft. in freight. Transport of kiln-seasoned rather than green timber saves 10% on freights, and transport of dressed rather than rough timber saves > 20%. Freight savings resulting from square docking both ends of boards to pre-determined lengths can amount to 15%.

1150. LOWERY, D. P. **Management of log inventories.** *Res. Note Intermt. For. Range Exp. Sta.* No. 63, 1959. pp. 4.

Discusses deterioration (checking, stain and decay) occurring in logs during prolonged storage in log-decks before sawing, and suggests control measures, including use of logs in the order in which they came in, construction of a hard-road system to facilitate winter handling, painting log ends to reduce checking, and the use of sprinklers. Sprinkling systems are compared.

85. Grading of Wood and Wood Products

851. Timber Quality in General

See No. 1012.

852. Detection, Recognition and Assessment of Injuries and Defects

See also Nos. 515, 522, 593, 629, 907, 944, 1027, 1054, 1145, 1150.

1151. MCHUGH, J. J. **Non-destructive measurement of timber defects.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 11 (4), 1959 (16–23). 6 refs.

Reviews several non-destructive techniques (involving X-rays, γ-rays, ultrasonic devices etc.) for detecting and measuring internal defects (e.g. gum veins, termite pipes etc.) in standing trees, felled timber, telegraph poles and marine piles, with suggestions for combining the techniques in certain cases.

1152. EDAMATSU, N., and HIRAI, S. [**Wane and knot in square[s] cut from small logs of *Cryptomeria.***] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 105, 1958 (187–218). 15 refs. [Jap.jap.e.*e.*]

[Cf. *F.A.* 19 No. 3595.] A fuller account, covering both defects. There was no apparent correlation between log size and mean values for knots (size, number, distribution). Only one square had 4 clear faces, 95% had none. Wane was the grade-determining factor for most squares.

1153. KANO, T., EDAMATSU, N., and KABURAGI, Z. [**Quality of small sawlogs from the planted *Cryptomeria.* Report I. Knots in logs from Kamabuchi.**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 112, 1959 (49–113 + 1 plate). 10 refs. [Jap.e.*e.*]

A study was made of two 4-m. logs from each of 97 trees felled in an even-aged 51-year-old plantation of *C. japonica.* Occurrence, distribution, number, size etc. of knots are discussed in detail (5-page English summary) and the experimental data illustrated in 100 diagrams and graphs.

1154. ISAKA, S. [**The distribution of compression failures in trunk.**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 111, 1959 (183–92 + 8 photos). 8 refs. [Jap.]

A detailed study of the stems of 2 *Picea jezoensis* and 2 *Abies mayriana,* damaged in a typhoon,

Hokkaido 1954. From 24 to 41 disks were cut from each stem and the position of knots and the area of damaged wood in each disk are indicated in drawings together with photographs of typical damage to tissues. The association of cracks and other types of wood failure with knots is emphasized.

1155. HIRAI, S., and YAJIMA, H. **[Studies on indication of wood quality of forest trees. I. Indication of several qualities of the wood of *Abies firma* Siebold et Zuccarini.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (219–36). 17 refs. [Jap.e.*e.*]

Measurements were made on specimens cut at different heights on two sample trees from a natural stand, and results are tabulated and discussed. The characters measured were (1) standard deviation of ring width, (2) successive difference of ring width, (3) 'waviness' [deviations in radial longitudinal section] of annual ring, (4) knottiness, (5) % of imperfect heartwood.

1156. HIRAI, S. **[Studies on indication of wood quality of forest trees. III. Unevenness of annual ring width in the wood of *Abies firma* Siebold et Zuccarini from Kido District, Fukushima Prefecture.]** *Bull. Tokyo Univ. For.* No. 55, 1959 (191–209). 7 refs. [Jap.e.*e.*]

The unevenness of ring width as a possible indicator of wood quality was studied on 4 sample trees, and compared with values derived from an earlier study of trees from another area.

1157. HIRAI, S. **[Studies on indication of wood quality of forest trees. II. Percent of false heartwood and unevenness of annual ring width in the wood of *Fagus crenata* Blume.]** *Bull. Tokyo Univ. For.* No. 54, 1958 (237–43). 10 refs. [Jap.e.*e.*]

F. crenata wood in Hokkaido is conventionally divided into 'white' and 'red' by the appearance of its bark. Measurements were made of number of annual rings, average ring width and % false heartwood, in 21 logs of 'white' and 31 of 'red' Beech. 'Red' had the smaller values for average ring width but the larger % of false heartwood, and the heartwood was more nearly central than in 'white'.

1158. TOMAŠEVSKI, S. Učešće i raspored neprave srži kod bukovih stabala u gospodarskoj jedinici Ravna Gora. **[The amount and distribution of red heart in Beech trees at Ravna Gora.]** *Šum. List* 82 (11/12), 1958 (407–10). [Croat.e.]

Measurements on 175 felled Beech trees showed that red heart is most extensive between the butt and a height of 8 m., and particularly between 1 and 4m. Beech growing on poorer sites and on warm (S. and W.) aspects had a larger % of red heart than that growing in more favourable conditions.

853. Grading of Wood in the Rough

See also Nos. 815–6, 1057.

1159. HEISKANEN, V., and SIIMES, F. E. Tutkimus mäntysahatukkien laatuluokituksesta. **[A study on Pine log grading.]** *Pap. ja Puu* 41 (8), 1959 (359 . . . 368). 4 refs. [Fi.e.] P.R.

Discusses proposals, based on a study at 4 sawmills, for a revision of the grading used since 1949. These maintain the division into 3 grades, but 3 diam. classes are recognized instead of two. Requirements relating to knots and scars, sweep, heart shakes and rot are modified, especially in grade III. *From authors' summary.*

1160. HENLEY, J. W., and HUEY, B. M. **Grading Southwestern Ponderosa Pine logs.** *Res. Note Colo. Coll. For. Range Mgmt.* No. 10, 1959. pp. 2.

Summarizes a study to determine the applicability of the Pacific Northwest Ponderosa Pine grading system to the same species in the Southwest region. Some improvements are suggested.

854. Grading of Converted Timber

See also Nos. 1054, 1072.

1161. **At last a Canadian lumber standard.** *Timber of Canada* 20 (6), 1959 (34–6, 38–9). 1 ref.

Includes the most important sections of the Canadian Standards Association Specification No. 0141-1959—'Specification for yard lumber' for buying, selling and use of Canadian softwood, not further manufactured than by cross-cutting, ripping, resawing, joining cross- or end-wise or both in a flat plane, or surfacing with or without end-matching and working.

86. Pulp Industries. Composite Materials made Wholly or Partly of Woody Matter. Chemical Utilization of Wood

861. Pulp and Paper Manufacture. Textile and Other Cellulose Derivatives

See also Nos. 527, 543, 545, 851, 890, 925, 928–9, 932–4, 989, 1120, 1279, 1295.

1162. MAŠIREVIĆ, D. Osobine i upotrebljivost naše topole za proizvodnju celuloze III. Jasika (*Populus tremula* L.) kao sirovine za proizvodnju sulfitne celuloze za papir i za dalju hemisku preradu. **[The properties and possibility of using Jugoslavian Poplars for cellulose production. III. *P. tremula* as a raw material for sulphite pulp for paper and further chemical processing.]** *Topola, Beograd* No. 7, 1958 (595–603). [Serb.g.]

Aspen, pulped by the bisulphite process under mild conditions, gave a high yield of cellulose with good mechanical properties and a very white appearance (before bleaching). In spite of data in the literature it was found that Aspen cellulose had a relatively high pentosan content, not easily separable from it. [Cf. *F.A.* 20 No. 1212.]

1163. TERATANI, F., and KIMURA, Y. **[Studies on pulp and papermaking. XIX. Studies on chemigroundwood pulp from hardwoods (2).]** *Wood Res., Kyoto* No. 20, 1958 (37–54). 7 refs. [Jap.e.*e.*]

Describes a laboratory investigation into the effects of certain pretreatment conditions, cooking temperature and pressure, on the qualities of chemigroundwood pulps made from test blocks of *Quercus crispula, Fagus crenata, Acer palmatum, Magnolia kobus, M. obovata, Betula grossa, B. tauschii, Aesculus turbinata, Populus maximowiczii, Abies firma, Pinus densiflora, Chamaecyparis obtusa* and *C. pisifera.* Detailed physical and anatomical data are tabulated in English.

1164. PHILLIPS, F. H., and WATSON, A. J. **Project P.P.17. Sub project P.P.17–1. Progress report No. 6. Groundwood and chemigroundwood pulps from New Guinea timbers.** Division of Forest Products, C.S.I.R.O., Melbourne. 1959. pp. 13. 7 refs. Limited distribution.

Studies the production and properties of groundwood (g.w.) and chemigroundwood (ch.g.w.) pulps from *Araucaria* thinnings and from *Excoecaria agallocha* and *Camptostemon schulzii* (two species of a Mangrove association), grinding being done in a laboratory grinder. G.w. pulps made from *Araucaria* thinnings were inferior in strength to, and of darker colour than, those made from Swedish Spruce and *Pinus radiata* under similar conditions; *E. agallocha* g.w. pulp was of better quality than that from *C. schulzii* and may prove suitable for g.w. production. As a result of neutral sulphite and NaOH pretreatments, ch.g.w. pulps of higher strength than the normal g.w. pulps were obtained, the neutral sulphite being more satisfactory than the NaOH pretreatment; ch.g.w. pulps made in this way from *Araucaria* spp. had similar strength properties to commercial g.w. pulp.

1165. FAHMY, Y. A., and ASHMAWY, E. EL. **Suitability of *Eucalyptus camaldulensis* Dehn. for production of viscose pulps.** *APPITA, Melbourne* 12 (6), 1959 (210–5). 9 refs.

Egyptian-grown *E. rostrata* (ca. 9 years old) does not give satisfactory viscose pulps by the acidic bisulphite process. Suitable viscose pulps were obtained using the prehydrolysis alkali process followed by hot refining. The yield, and the degree of polymerization, were rather low, but the latter could be increased by modifying the conditions. It is preferable to reduce the pentosan content by mild prehydrolysis and cold refining rather than by strong prehydrolysis and hot refining. Yields, α-cellulose contents, and degrees of polymerization were all higher for the cold-refined pulps. *From authors' summary.*

1166. WATSON, A. J. **Influence of wood storage on pulping and papermaking properties [with discussion].** *APPITA, Melbourne* 13 (1), 1959 (49–57). 11 refs.

Sulphate pulps of wood from freshly felled *Pinus radiata* and *Eucalyptus regnans* were compared with pulps made from matched samples of wood stored for various periods under different conditions. Air-dry chips of *E. regnans* showed little change in pulping and papermaking characteristics after storage for 2 months at room temperature. Air-dry *P. radiata* chips were not affected by storing for 3 and 7 months or by oven drying them for 24 hr. at 105° C. immediately before pulping. Underwater storage of *P. radiata* at room temperature for 3 months appeared to have an adverse effect on some pulp strength properties. *From author's summary.*

1167. REID, H. A. **Pine pulpwood storage—effect on pulping properties.** *APPITA, Melbourne* 13 (1), 1959 (41–8). 1 ref.

Pinus radiata pulpwood billets from 24- to 31-year trees were stacked open or close, or immersed in water. Some were sprayed with fungicide, and some were barked. At various intervals up to 15 months, samples were pulped and pulp strength assessed in terms of tear factor at chosen burst factors. Results show that with normal storage (stacked, with ample air circulation) pulp strength decreases by ca. 35% and the oven-dry weight of the wood by 9–21%, after 12–15 months. Close stacking, and more particularly underwater storage, retarded somewhat the rate of loss in pulp strength; barking, though apparently preferable for long-term storage, may sometimes accelerate the rate of loss initially; spraying with fungicide had no noticeable effect. Storage causes a drop in basic density, and probably an increase in alkali required to cook the wood. Stored wood, however, causes a minimum of frothing trouble, is more easily barked, and can ensure uninterrupted mill operation.

862. Composite Materials made Wholly or Partly of Woody Matter

1168. **Developments in test methods for fibreboard and particle board.** FAO, Rome. No. *FAO/WTC/58/Suppl.* 1, 1959. pp. 73 + 30 plates. 30 refs.

This publication has been compiled to make the results of a working party on methods of testing boards widely known. It is arranged in the sections: definition of terms; general principles for tests; FAO recommended methods of test for evaluating the properties of board products; methods under development; plans for further work; and fire test methods.

1169. KEYLWERTH, R. Erreichte und erreichbare Verminderung der Anisotropie in Holzwerkstoff-Platten. [**Actual and possible reduction of anisotropy in wood-based boards.**] *Holz Roh- u. Werkstoff* 17 (6), 1959 (234–8). 4 refs. [G.g.e.] P.R.

Stellate-bonded plywood is the best method so far used to reduce anisotropy. Further improvement of particle and fibre boards might be possible by matching the properties of the glues to those of the wood, and by orientating the particles in a certain way. *From author's summary.*

1170. KOLLMANN, F. Über die mechanische Bewährung von Holzfaser-Hartplatten und Holzspanplatten bei der Verwendung in den Tropen. [**The mechanical suitability of fibre boards and particle boards used in the tropics.**] *Holz Roh- u. Werkstoff* 17 (6), 1959 (239–45). 1 ref. [G.g.e.] P.R.

The moisture content of fibre and particle boards increased, when they were stored in controlled-environment chambers (40 ± 2° C., 93 ± 3% r.h.) for various periods to simulate tropical conditions. This seemed to be connected with certain irreversible changes in bonding and structure because, after reconditioning in a normal climate, the boards showed an elevated equilibrium m.c. The modulus of elasticity and the bending strength of both types of board decreased (by 24–45%) in tropical conditions, and though they rose again after drying, they did not regain their original values. The tensile strength ⊥ of particle boards decreased by ca. 50%, but after reconditioning in a normal climate, this reduction was almost made good again.

1171. BECKER, G. Verfahren zum Schutz von Faser- und Spanplatten gegen Organismen bei Verwendung in den Tropen. **[Processes for the protection of fibre and particle boards against [plant and animal] organisms in the tropics.]** *Holz-Zbl.* 85 (82), 1959 (1075). 29 refs. [G.]

A lecture, reviewing preparations and processes, with special reference to termites.

1172. HRDÝ, I. Pokus o zvýšení odolnosti dřevovláknitých desek proti termitům. **[Trials on increasing the resistance of fibreboards to termites.]** *Zool. Listy, Brno* 8 (3), 1959 (193–207 + 2 plates). 25 refs. [Cz.g.*g.*] O.R.S.

Hardboards treated with various chemicals alone (PCP, Na pentachlorophenate and trichlorobenzene) or in combination, were exposed to attack by *Kalotermes flavicollis* in laboratory tests. Methods of application, solvents, concentrations and application rates are shown in a table. The combination 5% PCP, 2% γBHC and 93% trichlorobenzene gave the best protection, slightly reduced by exposure to artificial tropical conditions (60° C., 96–98% r.h.) for 20 days, but still adequate. Trichlorobenzene alone was unsatisfactory and PCP alone less satisfactory than in combination with the other chemicals.

1173. MUELLER, L. A. **Beetle-killed Engelmann Spruce shows promise as a raw material for particle board.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 35, 1959. pp. 6.

Tests at Madison indicated that sound wood from beetle-killed trees was suitable for the production of particle board, and that the low density of Engelmann Spruce is apparently a desirable quality for this purpose.

1174. PARASCHIV, E., and DUPU, M. Utilizarea lemnului de salcie la fabricarea plăcilor aglomerate din aşchii de lemn. **[The use of Willow in the manufacture of particle board.]** *Industr. Lemn.* 7 (4), 1958 (134–9). 10 refs. [Rum.russ.g.f.e.]

Tests with Willow wood from the Danube (generally used as firewood) showed that it could be used in a proportion of 6–30% with other woods without adversely affecting the colour or strength of 'Urelit' particle board.

1175. HEEBINK, B. G., and HANN, R. A. **How wax and particle shape affect stability and strength of Oak particle boards.** *For. Prod. J.* 9 (7), 1959 (197–203). 4 refs.

Boards made of particles of various sizes and shapes (from one log of *Quercus rubra*) and 8% of oven-dry particle weight of urea-resin solids, with or without the addition of 1% wax as an emulsion, were tested for dimensional stability, static bending strength and tensile strength ⊥ to face. Boards made with flakes 1 in. long were the strongest in all respects and the most stable linearly, followed in declining order of strength by boards from ¼-in. flakes, planer shavings, slivers, fines, and sawdust. The wax solution had no appreciable effect on strength or stability, but retarded liquid water absorption. Oak plywood made from the same log was ca. twice as strong and stiff in the face grain direction, but less strong in tension ⊥ to the surface.

1176. MAKU, T., HAMADA, R., and SASAKI, H. **Studies on the particle board. Report 4. Temperature and moisture distribution in particle board during hot-pressing. Report 5. Influence of press-time on thickness and cleavage strength of particle board.** *Wood Res., Kyoto* No. 21, 1958 (34–50). 7 refs. [E.e.jap.]

(4) Deals with 20-mm. boards made from (*a*) mixed particles 4–10 × 1–5 × 0·1–2 mm. of *Betula maximowicziana* and *Fagus crenata*, and (*b*) particles 8–15 × 3–20 × 0·1–0·5 mm. of *B. maximowicziana* only. When initial m.c. (i.e. of the mat before hot-pressing) was 0%, temperature behaviour in the central layer showed a normal thermal-conduction curve, but when initial m.c. was relatively high, the temperature of the central layer remained constant (ca. 100° C.) for a while, reaching for (*b*) a maximum point > 100°. The higher the initial m.c., the longer the duration of constant temperature, and, for (*b*), the higher the maximum temperature. The drying rates of both boards were also examined. (5) Investigates the degree to which the initial m.c. influences the relation between pressing time and curing of the glue used (a 55% urea resin with a 10% solution of NH_4Cl as hardener). Cleavage strength increased abruptly with pressing time and decreased gradually after attaining a maximum value, results indicating that maximum strength is obtained for boards made with an initial m.c. of ca. 14%.

1177. IWASHITA, M., MATSUDA, T., and ISHIHARA, S. **[The influence of differences in moisture content of wooden particles upon the pressing of particle boards.]** *Wood Ind., Tokyo* 14 (8), 1959 (19–25). 10 refs. [Jap.e.*e.*] P.R.

Boards were made of *Pinus densiflora* particles (0·2 × 1–3 × 20 mm. in the surface layers and 0·5 × 3–6 × 40 mm. in the core), of m.c. 25, 20 and 15% in the surface layers and 7, 10 and 15% in the core. The relations between the pressing conditions and particle m.c. and the board properties are graphed. [Cf. *F.A.* 18 No. 3498; 19 No. 1156.]

1178. STRICKLER, M. D. **Effect of press cycles and moisture content on properties of Douglas-Fir flakeboard.** *For. Prod. J.* 9 (7), 1959 (203–15). 5 refs.

Tests that varied the degree and duration of maximum pressure, moisture content (6, 9 and 12%), and moisture distribution, in the manufacture of boards of 3 densities, revealed complex interactions, but indicated that (within limits) heat penetration to the centre of the boards increases with over-all m.c., surface m.c., and initial platen pressure; high surface moisture improved bending strength and elasticity, and, if combined with at least 2 minutes at maximum pressure, also thickness stability, while adversely affecting internal bond strength and linear expansion; high and short initial pressure improved elasticity, but constant pressures were better for internal bond strength and linear stability.

1179. LAMBERTS, K., and PUNGS, L. **The application of high-frequency heating in the particle board industry.** *Comp. Wood.* 5 (2/3), 1958 (17–31). 5 refs. P.R.

Results are given of experimental investigations to determine (*a*) savings in pressing time obtainable by various R.F. heating processes, depending on the thickness, density and m.c. of the boards, and (*b*) R.F. power required in connexion with the savings in pressing time; and to justify the process economically from the results of energy measurements [cf. *F.A.* 15 No. 4333]. The advantages of two methods involving (I) R.F. preheating of the wooden chip mass outside the press combined with contact heating alone in the press, and (II) combined R.F. and contact heating during the pressing process are examined. Equations expressing the electric-energy requirements for heating the chip mass from 20° to 90° C. indicate that the main heat requirements for hardening are produced in the R.F. field; in the press itself, hardening is achieved by a relatively small increase in temperature and by the simultaneous effect of the pressure. Details are given of the combined R.F. and contact heating method as used successfully in Holland for a number of years for single- and multi-opening presses not working continuously, and attention is drawn to plants currently being designed to work according to the combined method of R.F. and contact heating with increased surface moisture.

1180. DUNCAN, T. F. **Effects of heat transfer in multi-platen process.** *Wood, Chicago* 64 (6), 1959 (56, 58). P.R.

In particle boards of two densities, viz. (1) White Pine chips, and Southern Pine flakes, both types ca. 0·0156–0·0625 in. thick, and (2) Cedar and mixed hardwoods with chips ca. 0·0625–0·125 in. thick, tests showed density to be a major factor in the heat transfer rate (h.t.r.), the centre-line temperature (c.-l.t.) of the denser boards being lower for the same platen temperature. The results obtained indicated that: (i) max. c.-l.t. for ¾-in. board is reached in 4–6 min. (press closing time, 2–2·5 min.); (ii) particle geometry and species as affected by extractives are very important in determining h.t.r. and ultimate c.-l.t. during a given press cycle; (iii) h.t.r. varies inversely with board density regardless of particle size; (iv) the effect on h.t.r. of the resin type used is negligible; and (v) time/temperature curves for the 3 types of board level out between 4 and 6 min. in the press, indicating the possible occurrence of: (*a*) moisture dissipation from the board, or (*b*) the setting-up of a temperature gradient in which heat is lost as fast as it is absorbed by the particles.

1181. ROBINSON, J. G. **Dry process hardboard.** *For. Prod. J.* 9 (7), 1959 (11*A*–14*A*).

Describes various dry processes (characterized by the use of air instead of water as the medium for conveying the fibres), including 'snowfall' and vacuum-type felters, their products, etc. In addition to the elimination of problems of water supply and disposal of effluents, chief advantages claimed over wet processes are cheaper installations, increased yield, and versatility. The chief drawbacks are difficulty of process control and fibre storage.

1182. SCHWARTZ, S. L. **Hardboard from Red Alder and from a mixture of slow-growth southern Oaks.** *Rep. U.S. For. Prod. Lab., Madison* No. 2125, 1958. pp. 8 + 6 gphs., 5 tbls. 6 refs. P.R.

A study (1) to demonstrate the suitability of two widely different classes of hardwood (Red Alder [*Alnus rubra*] and a mixture of Red and White Oaks [*Quercus falcata, Q. coccinea, Q. velutina, Q. stellata, Q. alba* and *Q. prinus*]) for the production of hardboard, and (2) to discover how the degree of hydrolysis influences yield, board strength, and sizing efficiency. The following factors were covered: the effect (i) of the degree of steam cooking on yield and quality of the board stock, (ii) of the amount of alum and of size added to the stock on board quality [cf. *F.A.* 15 No. 2061], and (iii) of pressure on Oak hardboard. From the data obtained on the response of both materials to defibration, pulping and pressing treatments, it was established that for untreated hardboard prepared from both classes, (*a*) the flexural strength and toughness reach an optimum at the 83–85% yield level; (*b*) water absorption and thickness and volume-change decrease with yield; and (*c*) the linear dimensional change, though relatively small, increases with a decrease in yield. As Oak was sensitive to steam cooking it was necessary to defibrate it at 125, and the Alder at 175 lb./sq. in.

1183. BRYANT, L. H., and HUMPHREYS, F. R. **Building boards from sawmill waste.** *Comp. Wood* 5 (2/3), 1958 (41–6). 17 refs. P.R.

Describes work done in 1949–53 [cf. *F.A.* 12 No. 544] on *Callitris glauca, Pinus radiata* and *Eucalyptus crebra* bark/sawdust mixtures in making building boards. In the present paper, data on the *E. crebra* boards are reported, the results indicating that boards having the best properties are made from equal weights of bark and sawdust with 1% paraformaldehyde, pressed at 300 lb./sq. in. at 130° C. for 6 min. Maximum strength properties were obtained with minimum water absorption at 17% m.c., the boards also having a more acceptable appearance than those made with a lower initial m.c. Pressure or temperature had no significant effect on board properties once minimum requirements for the reaction of materials in the bark and sawdust with formaldehyde were met, and there was good correlation between the density of the boards made (using equal weights of bark and sawdust) and their modulus of rupture (correlation coefficient 0·847). The commercial possibilities of the process are examined and discussed.

1184. YONEZAWA, Y., MURATA, T., and SUZUKI, I. [**The fundamental physical and chemical research on raw materials for fiberboard (1st report). Effect of the chemical components in the raw material (I) & (II).**] *Bull. For. Exp. Sta., Meguro, Tokyo* No. 113, 1959 (111–34). 7 + 34 refs. [Jap.e.*e.*]

(I). A study was made of thin wood shavings to determine the effect of (*a*) alcohol extraction, (*b*) delignification, and (*c*) heat treatment. Dry tensile strength increased but wet tensile strength fell as a

result of (*a*) and (*b*). Tensile strength of both original and extracted shavings fell as a result of (*c*), the fall being greater at higher temperatures. With delignified shavings, however, the effect of (*c*) was to reduce dry tensile strength, but to leave wet tensile strength unchanged or even slightly increased. (II). A study was made of fibreboards made from mechanical pulp that had been (1) alcohol extracted, (2) delignified, compared with (3) untreated. Whereas air drying produces board of lower density and strength than hot-pressing in (3), board so made from (2) was equal to hot-pressed board in both properties; (1) had no such effect. Heat treatment reduced the dry tensile strength of (2), but increased that of (3). Oil-tempering increased dry tensile strength of (3) but reduced that of (2); wet tensile strength was increased in all cases. It is concluded that lignin hinders the development of the full bonding effect of the bonding substances (especially hemicellulose) but contributes to the dimensional stability of the boards.

1185. SANO, Y., ISHIHARA, S., and NAGASAWA, S. **[Studies on the production of fibreboards from Bamboo. (I.) Manufacturing process at [with] high temperature cooking and the atmospheric defibering from [defibration at atmospheric pressure of] Mosochiku [*Phyllostachys pubescens*].]** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 113, 1959 (135–44). 3 refs. [Jap.e.*e.*]

Deals with laboratory experiments on pretreatments (with H_2O, 2% Na_2CO_3, or 0·5–2% H_2SO_4), and conditions of cooking, defibration and hot pressing of the sheets.

1186. NAKANO, R., and KADITA, S. **[Studies on the variation of properties in hardboard. (I). Variation of bending strength in hardboard manufactured by the Foudrinier machine.]** *Wood Res., Kyoto* No. 21, 1958 (73–81). 3 refs. [Jap.e.*e.*]

[Cf. *F.A.* 17 No. 4574.] In order to test the bending strength (b.s.) of 4 classes of hardboard (tempered and untreated), samples of each were kept in a box at room temperature and 65 ± 3% r.h. for one month. The results (tabulated in detail in English) indicated the existence of a constant linear relationship between sp. gr. and b.s. but not between sp. gr. and thickness, and the variation ranges of b.s., sp. gr. and thickness were less than those obtained in Germany in 1957 [see *F.A.* 20 No. 1226].

1187. KOLLMANN, F., and KRECH, H. Querzugfestigkeit und Scherfestigkeit von Holzfaser-Hartplatten. **[Tensile strength perpendicular to the surface and shear strength of hardboards.]** *Holz Roh- u. Werkstoff* 17 (8), 1959 (326–7). 3 refs. [G.e.] P.R.

Variation in tensile strength was high, and at least 10 specimens would be needed for such tests. Variation in shear strength was lower. A close correlation was found between the two properties.

863. Wood Hydrolysis. Saccharification

1188. HAJNY, G. J. **A technical review of developments in microbiological utilization of wood sugars.** *For. Prod. J.* 9 (5), 1959 (153–7). 32 refs.

Discusses techniques, micro-organisms, yields etc. of actual commercial and experimental uses of sugars in acid hydrolysates and spent sulphite liquors for the production of alcohol, butanol, 2,3-butanediol, glycerol, arabitol and erythritol by fermentation, fodder yeasts, etc.

1189. ODINCOV, P. N., *et al.* Gidroliz celljulozosoderžaščih materialov nebol'šimi količestvami sernoj kisloty. **[The hydrolysis of cellulose-containing substances by small amounts of H_2SO_4.]** *Gidrol. lesohim. Prom.* 10 (8), 1957 (3–6). 12 refs. [Russ. russ.] P.R.

When the material, including Spruce and Birch sawdust (m.c. 1%), after a 15-min. preliminary dry grinding, was ground up with 75% H_2SO_4 in two different proportions, at 40° C. and for different lengths of time, considerable yields of reducing sugars were obtained, the sugars/acid ratio reaching 4/1. The chemical processes are described.

1190. STRANKS, D. W. **Fermenting wood substrates with a rumen cellulolytic bacterium.** *For. Prod. J.* 9 (7), 1959 (228–33). 20 refs.

Describes experiments, by the Warburg and culture test methods, with wood meal of *Pinus strobus*, *P. resinosa*, *Larix laricina*, *L. occidentalis*, *Pseudotsuga taxifolia*, *Picea mariana*, *Populus tremuloides*, *Fraxinus nigra*, *Ulmus americana*, *Tilia americana*, *Betula papyrifera* and *B. lutea*. *P. tremuloides* and *F. nigra* could be fermented without pretreatment. Other woods were rendered fermentable by milling, alkali cooking, and fungal predigestion, possibly, it is suggested, through a resulting reduction in chain length of the cellulose. Softwoods were generally less fermentable than hardwoods. [Cf. *F.A.* 17 No. 4576.]

866. Utilization of Wood Extractives

See also Nos. 1228–9.

1191. KOZŁOW, W. [KOZLOV, V.], and KOŁENKO, I. Badania nad procesem ekstrakcji karpiny. **[Investigations on the [solvent] extraction of stumpwood.]** *Sylwan* 103 (3), 1959 (1–17). 13 refs. [Pol.] Transl. by A. Kwiatkowski from an [unpublished] Russian source.

Tabulates and graphs the results of extraction of resinous stumpwood [of *Pinus sylvestris*?] at various periods up to 18 years after the trees had been felled, with butanol, benzine, and dichloroethane.

867. Destructive Distillation

See also No. 1009.

1192. TJUL'PANOV, R. S. Issledovanie i rasčet termoliza drevesiny. **[Studies and calculations on the thermolysis of wood.]** *Gidrol. lesohim. Prom.* 10 (6), 1957 (13–4). 4 refs. [Russ.] P.R.

In order to reduce the extent of secondary reactions during thermolysis, Birch wood was comminuted to a particle size of 0·6 mm. and dry-distilled in suspension in a current of N, using a special laboratory retort rocking 400 times per minute. By this means the volatile products were at once removed from the reaction zone, and arrangements were provided for rapid condensation. The bulk of the products at 200–300° C. was made up of

CO_2, CO and H_2O. With increase of temperature, acids and tar came over, and at 400–600° there was still a considerable yield of tar and uncondensable gases with a relatively high content of hydrocarbons and H. The yield of condensable products practically ceased at about 600°. Increase of the rate of heating caused a shift of the yield curves for tar and some other products in the direction of higher temperatures, but rate of heating did not (in the range studied) affect the final yield of the various products, which considerably exceeded those obtainable in ordinary laboratory retorts. The yield of tar was 27% and of acids up to 10% of the dry weight of wood. From the curves obtained the author derives reaction-rate equations from which the yield of total volatile products may be calculated for any temperature range.

89. Other ('Minor') Forest Products

1193. KNIGGE, W. Möglichkeiten und Grenzen forstlicher Nebennutzungen. **[Possibilities and limitations in the utilization of minor forest products.]** *Forstarchiv* 30 (8), 1959 (145–54). 174 refs. [G.]

Discusses yields and financial possibilities of various crops such as resin, tanbark, Christmas trees, medicinal plants, fruit (the berries of *Hippophaë rhamnoides* being much sought after for vitamin manufacture), fungi, grass and litter, and peat, gravel, etc.

892. Vegetable Products

1194. OLIVER, B. **Nigeria's useful plants. Part II. Medicinal plants (3).** *Nigerian Field* 24 (3), 1959 (121–43).

[Cf. *F.A.* 20 No. 5373.] *Garcinia kola* to *Piliostigma reticulatum.*

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 69–70, 73, 206, 891, 911.

1195. KURTH, E. F. **Chemical analyses of Mountain Hemlock.** *Tappi* 41 (12), 1958 (733–4). 4 refs. P.R.

The extractive content of the wood of *Tsuga mertensiana* was ca. 6·6%, and that of bark 29·4–39·5%, less in the inner than in the outer bark. Tannin content of the bark was 15·8–21·0%. Other extractives in the bark were waxes, a purple-red colouring matter and protocatechuic acid. The ether extract of the inner bark appeared to contain *d*-catechin and *l*-epicatechin.

1196. MAYER, W., and KUNZ, W. Über ein zweites Vorkommen von Hamamelitannin. **[A second occurrence of hamamelitannin.]** *Naturwissenschaften* 46 (6), 1959 (206). [G.] O.R.S.

In bark of *Castanea sativa*. The only previous instance is its isolation by Grüttner from *Hamamelis virginiana* in 1898.

1197. ISTAS, J. R., and RAEKELBOOM, F. L. Analyse chimique des écorces d'essences feuillues congolaises. **[Analysis of the barks of broadleaved species of the [Belgian] Congo.]** *Bull. agric. Congo belge* 50 (3), 1959 (697–703). 4 refs. [F.f.du.]

Samples were taken from young and mature trees of *Dialium lacourtianum, Uapaca guineensis, Marquesia macroura, Burkea africana, Marquesia acuminata, Albizzia ferruginea, Markhamia tomentosa* and *Ongokea gore*. Further study is merited of the first and second for tannins, the third for alkaloids, and the fourth for the alcohol/benzene extract containing both tannins and alkaloids.

1198. BENNETT, H., and COVENEY, R. D. **Mangrove bark from Sarawak.** *Trop. Sci., Lond.* 1 (2), 1959 (116–30).

Describes analyses made of the barks of a series of girth sizes of *Bruguiera gymnorrhiza, Rhizophora conjugata* and *B. eriopetala*, and makes suggestions for the possible manufacture of tannin extracts from each.

1199. HATHWAY, D. E. **Experiments on the origin of Oak-bark tannin.** *Biochem. J.* 71 (3), 1959 (533–7). 19 refs. [British Leather Manufacturers' Research Association, Milton Park, Egham, Surrey.] O.R.S.

[Cf. *F.A.* 20 No. 3939.] Field experiments were made over two seasons on (1) variation of tannin content of stem bark with age, (2) disturbances in the normal distribution of tannin in stem bark brought about by girdling the bark, and (3) the translocation of phenolic precursors of the tannin in the sieve tubes of the phloem. Results include the following: (1) In young (6- and 8-year) plants, tannin accumulates during the period of active photosynthesis and growth, and the enhanced level is maintained until the following spring. Thus 8-year plants contain more tannin in the stem bark than 6-year ones. In older trees (50–100 years) the observed seasonal variation is probably not significant, an increase in the tannin content of the bark tissue being probably balanced by an increase in the (dead and living) bark tissue, so that the level (tannin % on a moisture-free-bark basis) remains without any significant variation throughout the season. (2) In the girdling experiments on mature trees, an accumulation of tannin was found above the girdle, suggesting that synthesis had taken place from phenolic precursors normally translocated downwards from the leaves. (3) Examination of the exudate obtained by cutting into the bark of growing trees and tapping the sieve-tube system, showed the presence of many of the phenolics found in the bark, including the pyrogallol precursors, (+)-gallocatechin and leucodelphinidin, of Oak bark tannin. The evidence suggests that these pyrogallol phenols, originating in the leaves, are translocated by the sieve-tube system to the cambium and undergo oxidation there, and that the resulting phlobatannin is stored in the bark.

1200. BURROWS, C. H. **Floor tile from Douglas Fir cork.** *Inform. Circ. Ore. For. Prod. Res. Cent.* No. 13, 1959. pp. 24. 8 refs.

This floor tile showed adequate wearing properties, was about equivalent to, or better than, tile from Mediterranean Cork Oak in properties tested, and its estimated retail selling price compares favourably with that of commercial flooring materials. Techniques used in its manufacture were similar to those followed in the production of wood particle

board. It is, therefore, likely that this tile could be manufactured by present methods for manufacturing particle board, with minor modifications or additions to equipment. *From author's summary.*

1201. KORYTNYK, W. **Examination of *Intsia* (*Afzelia*) *bijuga* bark.** *Aust. J. Chem.* 11 (2), 1958 (248–9). 3 refs. O.R.S.

The sawdust and bark have been found to be devoid of alkaloids. The bark contains 0·37% of β-amyrin and 0·10% of a saturated fatty acid material.

1202. GEISSMAN, T. A. **Constituents of *Melicope sarcococca* Laut.** *Aust. J. Chem.* 11 (3), 1958 (376–82). 6 refs. O.R.S.

Bark constituents include two optically active flavanones (−)-4′,5-dihydroxy-3′,7-dimethoxy-flavanone and its 4′-prenyl ether. *From author's summary.*

1203. PEARL, I. A., and DARLING, S. F. **Studies on the barks of the family Salicaceae. I. Tremuloidin, a new glucoside from the bark of *Populus tremuloides*.** *J. organ. Chem.* 24 (6), 1959 (731–5). 21 refs. O.R.S.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

See also No. 1194.

1204. BISSET, N. G. **Cardiac glycosides. Part I. Apocynaceae: the genera *Carissa* L., *Vallaris* Burm. f., *Beaumontia* Wall., *Anodendron* A. DC., and others. Part II. Moraceae: the genus *Ogcodeia* Bur. Part III. Moraceae: the genus *Antiaropsis* K. Schum.** *Annales Bogorienses, Bogor* 2 (3), 1957 (193–223). 65 refs. [E.e.] L.S.

All genera examined contained glycosides. The cardiotonic glycoside composition of niaarin, an arrow posion obtained from *O. ternstroemiflora* by Indians in W. Colombia, is similar to that of the latex and seed of *Antiaris toxicaria* used in Malaya and Indonesia for the same purpose.

1205. SCHMUTZ, J., and LEHNER, H. Die Alkaloide von *Aspidosperma polyneuron* M. Arg. *Aspidosperma*-Alkaloide, 4. Mitteilung. **[Alkaloids of *A. polyneuron*. *Aspidosperma* alkaloids, 4.]** *Helv. chim. Acta* 42 (3), 1959 (874–8). 17 refs. [G.g.] O.R.S.

Seven alkaloids were found in the root bark by paper chromatography; three isolated in crystalline form were quebrachamin, aspidospermin and palosin ($C_{23}H_{32}O_2N_2$, a new dihydroindol alkaloid of the aspidospermin group). Yohimbin was probably present. *From authors' summary.*

1206. PARIS, R.-R., and FOUCAUD, A. Sur les flavonoïdes des feuilles d'*Holarrhena floribunda* G. Don (Durand et Schinz): isolement d'un flavonoside identifié à l'isoquercitroside. **[The flavonoids of *H. floribunda*: isolation of a flavonoside identified as isoquercitroside.]** *C.R. Acad. Sci., Paris* 248 (18), 1959 (2634–5). 2 refs. [F.f.] O.R.S.

1207. GOODWIN, S., SMITH, A. F., and HORNING, E. C. **Alkaloids of *Ochrosia elliptica* Labill.** *J. Amer. Chem. Soc.* 81 (8), 1959 (1903–8). 16 refs. O.R.S.

Four alkaloids were isolated from the leaves. One was shown to be identical with isoreserpiline. The other 3, ellipticine, methoxyellipticine and elliptinine have been characterized and features of their structure suggested. *From authors' summary.*

1208. WALLS, F., COLLERA, O., and SANDOVAL L., A. **Alkaloids from *Stemmadenia* species—I. The alkaloids of [wood, bark and fruits of] *S. donnell-smithii* and [wood of] *S. galeottiana*.** *Tetrahedron, Lond.* 2 (3/4), 1958 (173–82). 25 refs. [E.e.] O.R.S.

1209. BISSET, N. G., CROW, W. D., and GREET, Y. M. **Alkaloids of the Australian Apocynaceae: *Kopsia longiflora* Merr. II. The identity of kopsamine.** *Aust. J. Chem.* 11 (3), 1958 (388–90). 6 refs. O.R.S. [Cf. *F.A.* 17 No. 1035.]

1210. GELLERT, E. **The constituents of *Cryptocarya pleurosperma* White and Francis. I. Pleurospermine: a new alkaloid of the leaves.** *Aust. J. Chem.* 12 (1), 1959 (90–6). 11 refs. O.R.S.

1211. **[Alkaloid content of *Duboisia* sp. and *Eucalyptus* spp.]** *Extr.* from *Rep. For. Comm. N.S.W. 1956/57*, 1959 (32).

Using a method evolved by the Plant Industry Division of the C.S.I.R.O., it has been possible to estimate the alkaloid content of samples of *Duboisia* spp. which previously had resisted analysis. Samples of leaf taken from one tree were studied, and it was found that: (1) the total alkaloid content was considerably higher in March than in September; (2) the hyoscine content of mature leaves picked in March was > that of small leaves, which in turn was > that of green twigs and stems; (3) apart from small dead twigs, all samples contained about the same % of hyoscyamine. Experimental work on New South Wales species (mainly Eucalypts) for rutin content was completed. The existence of rutin in the leaves of *Eucalyptus macrorrhyncha, E. youmani, E. delegatensis*, and *Grevillea robusta* was confirmed, and rutin was also found in the leaves of *E. caliginosa* and *E. cannonii*.

1212. HUMPHREYS, F. R. **Production of rutin from *Eucalyptus* leaves.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 11 (3), 1958 (18–23).

Discusses the selection and harvesting of the leaves of *E. macrorrhyncha* and *E. youmani*, drying, storage, grinding and extraction, further processing, and the location of extraction plants.

1213. CHATTERJEE, A., BOSE, S., and SRIMANY, S. K. **Studies on the constitution, stereochemistry, and synthesis of aegelin, an alkaloidal-amide of [leaves of] *Aegle marmelos* Correa.** *J. organ. Chem.* 24 (5), 1959 (687–90). 13 refs. O.R.S.

1214. CHATTERJEE, A., and BHATTACHARYA, A. **The isolation and constitution of marmin, a new coumarin from *Aegle marmelos*, Correa.** *J. Chem. Soc.* June, 1959 (1922–4). 5 refs. O.R.S.

Umbelliferone, skimmianine, marmin and γ-sitosterol have been isolated from the immature bark. The constitution of marmin has been established.

1215. JOHNSTONE, R., PRICE, J. R., and TODD, A. R. **Alkaloids of the Australian Rutaceae: *Lunasia quercifolia*. I. 7-Methoxy-1-methyl-2-phenyl-4-quinolone.** *Aust. J. Chem.* 11 (4), 1958 (562–74). 18 refs. O.R.S.

1216. GOODWIN, S., and HORNING, E. C. **Alkaloids of *Lunasia amara* Blanco. Structure of lunacrine.** *J. Amer. Chem. Soc.* 81 (8), 1958 (1908–12). 16 refs. O.R.S.

1217. RAPOPORT, H., and HOLDEN, K. G. **Isolation of alkaloids from *Balfourodendron riedelianum*. The structure of balfourodine.** *J. Amer. Chem. Soc.* 81 (14), 1959 (3738–43). 17 refs. O.R.S.

1218. PARIS, R.-R., and STAMBOULI, A. Sur la présence d'un alcaloïde nouveau, la técléine chez le *Teclea sudanica* Chev. **[A new alkaloid, tecleine, in [leaves of] *T. sudanica*.]** *C.R. Acad. Sci., Paris* 248 (26), 1959 (3736–8). 3 refs. [F.f.] O.R.S.

1219. ARTHUR, H. R., HUI, W. H., and NG, Y. L. **An examination of the Rutaceae of Hong Kong. Part II. The alkaloids, nitidine and oxynitidine, from *Zanthoxylum nitidum*.** *J. Chem. Soc.* May, 1959 (1840–5). 7 refs. O.R.S.

1220. SPOON, W., and LOOSJES, F. E. Samenstelling en eigenschappen van rotenon-houdende *Mundulea*-bast. **[Composition and properties of bark of *M. sericea* containing rotenone.]** *Tijdschr. PlZiekt.* 65 (3), 1959 (79–88 + 1 photo). 9 refs. [Du.e.] E.M.B.

The tree and the collection of the bark are described. Samples of bark from Java and from Nigeria were ground and compared, chemically and for their insecticidal effect, with Derris. The bark from Nigeria was only slightly effective but that from Java was more effective than Derris.

1221. SPOON, W. Het tropische plantaardige insekticide ryania. **[The tropical plant insecticide, ryania.]** *Repr.* from *Landbouwk. Tijdschr.* 71 (12), 1959 (369–73). 6 refs. [Du.e.] Price *Fl.*1.

Discusses its preparation from *Ryania pyrifera* from Trinidad and presents results of analyses and tests. The active principle has proved to be 14–15 times as effective as rotenone in controlling sugar-cane stalk borers in Java.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 70–1, 121, 517.

1222. YASUE, M., and MIYAZAKI, M. **[Studies on natural resins. VIII. Ultraviolet absorption spectra of resins from coniferous trees. (2).]** *J. Jap. Wood Res. Soc.* 5 (3), 1959 (81–2). 2 refs. [Jap.e.e.] P.R.

The natural phenolic resins of *Cedrus libani*, *Larix leptolepis*, *Picea abies*, *P. morinda*, *P. koyamai* and *Tsuga canadensis* exhibit maximum ultraviolet absorption bands at 229, 282 and 315 mμ in alcohol solution, and at longer wavelengths, 250, 295, and 360 mμ, in alcohol/alkali solution. The spectra are illustrated in graphs.

1223. BRUUN, H. H., GÅSLAND, S., and LUNDQVIST, G. **Isolation of palustric acid from the oleoresins of North-European Pine and Spruce by partition chromatography.** *Acta chem. scand.* 13 (5), 1959 (1039–41). 6 refs. [E.] O.R.S.

The palustric-acid content of fresh rosin from 60-year-old living trees was 15% and 21% for Pine and Spruce respectively of the total rosin acids in the sample. It is higher in Spruce than in any Pine species so far examined.

1224. SPOON, W. Kopal van Nieuw-Guinea. **[Copal from New Guinea.]** *Ber. Trop. Prod. Inst. Trop. Amst.* No. 267, 1959. pp. 16. [Du.e.] Price *Fl.*1.

Discusses its collection from *Agathis labillardieri*, export, grading, and chemical and physical properties.

1225. SAMAPUDHI, K. **Yarng oil.** *Proc. 4th World For. Congr., Dehra Dun 1954* Vol. 2, 1957 [1959], (711–9 + 13 photos., 1 map). [E.]

Describes the methods used in Thailand for tapping *Dipterocarpus alatus* and *D. turbinatus*, the properties of the oil, and experiments in its hydrogenation. Hydrogenated oils compared favourably with diesel oil, which they excelled in keeping properties. [Cf. *F.A.* 17 No. 2280.]

1226. PALMADE, M., and OURISSON, G. La structure de l'α-gurjunène (note préliminaire). **[The structure of α-gurjunene [isolated from oleoresin of *Dipterocarpus dyeri*] (preliminary note).]** *Bull. Soc. Chim. France* 1958 (6), (886–7). 6 refs. [F.] O.R.S.

1227. KHAN, A. H. **The essential-oil bearing plants of Pakistan. Part II. [Magnoliaceae-Zingiberaceae.]** *Pakistan J. For.* 8 (4), 1958 (342–73). Many refs. [Cf. *F.A.* 20 No. 5380.]

1228. GOTTLIEB, O. R., and MAGALHÃES, M. TAVIERA. **Essential oil of the wood of *Aniba firmula* Mez.** *Perfumery and Essential Oil Record, London* 50 (2), 1959 (121–3). 15 refs. P.O.

An essential oil isolated from wood of *A. firmula* from the Tiguea forest near Rio de Janeiro was composed almost entirely, in nearly equal parts, of benzyl benzoate and benzyl salicylate. This observation appears to be the first example of their occurrence as products of normal physiological origin in wood of a tree. The significance of this result in relation to the chemistry of the genus *Aniba* is discussed.

1229. MORS, W. B., MAGALHÃES, M. TAVIERA, and GOTTLIEB, O. R. **Physiological varieties of *Ocotea pretiosa*.** *Perfumery and Essential Oil Record, London* 50 (1), 1959 (26–7). 13 refs. P.O.

Two wood samples of *O. pretiosa* were analysed, one from a tree in Santa Catarina, the other from Minas Gerais, Brazil. The composition of their essential oils was completely different, and they can be considered physiological varieties of one species. The one containing safrol is the Brazilian Sassafras of commerce; the other contains methyleugenol as its major oil component.

1230. BIRCH, A. J., *et al.* **The biosynthesis of citronellal and of cineole in *Eucalyptus* [*citriodora* and *globulus*].** *Tetrahedron Letters, London* 1959 (3), (1–2). [E.] O.R.S.

Terminal branches were allowed to absorb by transpiration aqueous solutions containing a labelled precursor. The pattern to be expected is illustrated.

1231. HATT, H. H., TRIFFETT, A. C. K., and WAILES, P. C. **Acetylenic acids from fats of Santalaceae and Olacaceae: seed and root oils of *Exocarpus cupressiformis* Labill.** *Aust. J. Chem.* 12 (2), 1959 (190–5). 10 refs. O.R.S.

1232. LAMBERTON, J. A. **Studies of the optically active compounds of Anacardiaceae exudates. IV. The structures of the rearrangement products from the long-chain alicyclic keto alcohol of Tigaso oil [from *Campnosperma* spp.] in alkali.** *Aust. J. Chem.* 11 (4), 1958 (538–45). 16 refs. O.R.S. [Cf. *F.A.* 20 No. 1261.]

1233. LAMBERTON, J. A. **Studies of the optically active compounds of Anacardiaceae exudates. V. Further investigation of the exudate from *Campnosperma auriculata* Hook. F.** *Aust. J. Chem.* 12 (2), 1959 (224–33). 30 refs. O.R.S.

Results of a further examination are presented and discussed. The exudate of another Malayan species, *C. macrophylla*, proved to be unlike that from *C. auriculata* and to contain little oil.

1234. LAMBERTON, J. A. **Studies of the optically active compounds of Anacardiaceae exudates. VI. The exudates from *Pentaspadon officinalis* Holmes.** *Aust. J. Chem.* 12 (2), 1959 (234–9). 10 refs. O.R.S.

The oil consists mainly of 2-hydroxy-6-(heptadeca-*cis*-8′, *cis*,-11′-dienyl) benzoic acid. It is very similar to the oil of *P. motleyi* and does not contain optically active *cyclo*-hexenones of the type found in *Campnosperma* exudates.

1235. GARDUÑO GARCÍA, R. Nota sobre explotación de productos forestales de zonas áridas. **[Notes on the utilization of forest products of arid zones.]** *Mensajero for., Durango* 17 (176), 1959 (8–9, 19–23). [Span.span.]

Gives annual yields by region, weight and value, for 1955–57, of wax and fibres from plants of the semi-desert areas of Mexico, which occupy ca. 80% of the country.

1236. KURTZ, E. B., JR. **A survey of some plant waxes of southern Arizona.** *Journal of the American Oil Chemists Society, Chicago* 35 (9), 1958 (465–7). 7 refs. P.O.

Forty-two species indigenous to S. Arizona, selected for the occurrence of wax-like material or a heavy bloom on stems and leaves, and the occurrence of a thick cuticle, were investigated and yields of waxes are shown. The species include *Juniperus deppeana, Prosopis juliflora* var. *velutina, Quercus emoryi, Q. gambelii* and *Q. oblongifolia*. Whereas some species, e.g. *J. deppeana* and *P. juliflora*, produced considerable amounts of wax, the majority of xerophytes and succulents had only small amounts, showing that the generally accepted statement that plants native to arid regions possess thick waxy cuticles, needs modification. Some taxonomic relationships and some effects of sex on plant waxes are discussed.

1237. RUDLOFF, E. VON. **The wax of the leaves of *Picea pungens* (Colorado Spruce).** *Canad. J. Chem.* 37 (6), 1959 (1038–42). 14 refs. O.R.S.

[Cf. *F.A.* 17 Nos. 1057, 3496.] A chloroform-soluble neutral wax was isolated from leaves collected in autumn and winter. A cyclic structure rather than the linear etholides proposed for other conifer waxes accords with the analytical data. In spring and summer the wax was accompanied by an acidic fraction. *From author's summary.*

1238. HIRST, E. L. **Plant gums.** In *Proceedings of the Fourth International Congress of Biochemistry, Vienna 1958.* Pergamon Press, London, New York, Paris. Vol. 1, 1959. pp. 31–51. 44 refs. O.R.S.

A review, including data on tree gums (from e.g. *Acacia* spp., *Prunus* spp., *Anogeissus latifolia, Khaya* spp.).

1239. ASPINALL, G. O., HIRST, E. L., and NICOLSON, A. **The structure of *Acacia pycnantha* gum.** *J. Chem. Soc.* May, 1959 (1697–1706). 17 refs. O.R.S.

1240. SATWALEKAR, S. S., GUPTA, T. R., and NARASIMHA RAO, P. L. **Chemical and anti-bacterial properties of kinos from *Eucalyptus* spp. Citriodorol—the antibiotic principle from the kino of *E. citriodora*.** *Journal of the Indian Institute of Science, Bangalore* 39 (2), 1957 (195–212 + 5 plates). 19 refs. P.O.

Four species, *E. citriodora, E. robusta, E. pilularis* and *E. globulus*, were investigated for anti-bacterial properties. The kino from *E. citriodora*, which was the most promising, was studied in some detail and is described. Evidence for the presence of a fairly potent antibiotic substance, for which the name citriodorol is suggested, has been adduced and methods for its concentration are described.

1241. GELL, R. J., PINHEY, J. T., and RITCHIE, E. **The constituents of the kino of *Eucalyptus maculata* Hook.** *Aust. J. Chem.* 11 (3), 1958 (372–5). 6 refs. O.R.S.

Ellagic acid, *p*-hydroxycinnamic acid, naringenin, and a new flavanolone, aromadendrin 7-methyl ether, were isolated.

892.7. Fruits. Seeds. Fibres, Yarns and Flosses

See Nos. 1235, 1246.

892.8 Heather. Broom etc. Osiers. Canes and Bamboos. Reeds and Rushes. Thatching Materials

1242. GERLACH, J. C. **Bamboos and their uses.** *N.Z. J. Agric.* 98 (6), 1959 (583, 585, 587). O.R.E.

Describes the design and construction of a lath house for hardening-off plants, made from New-Zealand-grown *Sinocalamus oldhami*. Details of the working of the Bamboos, costs of the house, and the advantages are given. Total costs were far below those of a timber one, and the house can be quickly dismantled and re-erected elsewhere.

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. General

1243. CHAPMAN, G. W. **Ten years of forestry progress in Iraq.** *Unasylva* 13 (2), 1959 (77–80).

1244. GALLANT, M. N. **Report to the Caribbean Commission on forestry and the timber trade in the Caribbean area. Parts I & II.** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 1060, 1959. pp. 40 + pp. 104. Limited distribution.

Part I includes general descriptions and recommendations for the expansion of local markets and exports, establishment of industries, planting of timber species etc.; Part II, individual reports on 14 tours to member countries.

1245. BERTHON, P. Informe al gobierno de Honduras sobre las industrias de la madera. **[Report to the Honduras government on the timber industries.]** Expanded Technical Assistance Program, FAO, Rome. *FAO Report* No. 674, 1957. pp. 44. [Span.] Limited distribution.

A report in two parts with recommendations on: (1) exploitation of the forests, transport, utilization of the timber, costs and prices, natural regeneration, concessions; and (2) the sawmilling and plywood industries.

902. History of Forests and Forestry

See Nos. 282–4.

903. Forest Policy, General

1246. **General policy as regards the Chestnut: economic and social problems and pilot experiments. Note of the Secretariat.** [*Docum.*] *4th Sess. Comm. Int. Chât. 1958* No. *FAO/CH*/22, 1959. pp. 13. [E.]

Gives data on areas of Chestnut forests or groves, production of nuts and wood, and trade in Chestnut products, for Greece, Jugoslavia, Italy, France, Spain, Portugal, Switzerland and Turkey, discussing the reasons for, and suggestions for halting, the decline in consumption.

1247. **Some aspects of forest policy in the Federation of Malaya (based on a memorandum by Mr. E. J. Shrubsall, Director of Forestry 1953–56).** *Res. Pamphl. For. Res. Inst., Kepong* No. 25, 1959. pp. 51.

1248. **Forest policy [in New Zealand].** *Extr.* from *Rep. N.Z. For. Serv. 1958/59*, 1959 (17–40).

Reviews forest policy from 1874 to the present time.

904. General Regional Accounts of Forests and Forestry

1249. ŻABKO-POTOPOWICZ, A. Z problematyki kształtowania się geografi leśnictwa. **[Problems in the development of forest geography.]** *Zesz. nauk. Szkoł. Gospod. Wiejsk. Warsz.* (*Leśn.*) No. 2, 1959 (3–41). 220 refs. [Pol.g.russ.]

Discusses the characteristics of forest geography that make it difficult to regard it as a branch of economic geography, and that place it nearer to plant geography. The development of forest geography in capitalist countries (mainly those where German, English and French are the main languages), and in the U.S.S.R. and Poland, is discussed. It is considered that forest geography should be accorded general recognition as an independent branch of geography.

1250. Forstliches aus Schleswig-Holstein. **[Forestry in Schleswig-Holstein.]** *Forst- u. Holzw.* 14 (17), 1959 (362–82). 12 refs. [G.]

Contains the following: Land between two seas (*F. W. von Schrötter*) [history of Schleswig-Holstein and its forests, modern land use, etc.]; Climate, site conditions, natural forest communities and desired types of stocking in Schleswig-Holstein (*K. Freymann*); The occurrence and importance of the main timber species in the state forests of Schleswig-Holstein (*E. Kirchner*) [Oak, Beech, Pine, Larch and Spruce]; Afforestation problems near the coast (*H. Siebenbaum*); The aims of the Schmalenbeck Institute for Forest Genetics and Forest Plant Breeding (*W. Langner*); and the Federal Research Institute for Forestry and Wood at Reinbek (*J. Weck*).

1251. Sondernummer: Unterfranken. **[Special number: Lower Franconia.]** *Allg. Forstzeitschr.* 14 (34), 1959 (581–600). [G.]

Includes articles on the following: The Würzburg Oberforstdirektion (*Weber*) [description of main forest types and growth regions and of organization, staffing etc.]; The forest road network in Lower Franconia (*Linhart*) [including modern methods of roadbuilding]; Two major pests of the Lower Franconian forests (*Stockh*) [control of *Dasychira pudibunda*, chiefly by DDT in kerosene sprays or fogs from the ground, and of *Tortrix viridana* with DDT in diesel oil from helicopter].

1252. Forêts, chasse, pêche: Premier rapport général de l'Administration des Eaux et Forêts. **[Forests, hunting and fishing: First general report of the [Belgian] Forestry Administration.]** Ministère de l'Agriculture, Brussels. 1958. pp. 201 + 4 maps. [F.]

A general account of the forests of Belgium, their administration and protection, and forestry research; forest types, statistics and regulation of hunting, shooting and fishing.

1253. Aspetti forestali della regione Trentino—Alto Adige. **[Forestry aspects of the Trentino and Alto Adige.]** *Monti e Boschi* 10 (7/8), 1959 (291–443). [It.]

A special number with articles (in Italian with summaries of the whole issue in German, French and English) on the ecology, history, silviculture and exploitation of the forests.

1254. MOOSMAYER, H. Über die forstlichen Verhältnisse Syriens. **[Forestry in Syria.]** *Allg. Forstzeitschr.* 14 (38), 1959 (673–5). [G.]

Report on a study tour, describing the forests

and the work of the forest department, including Poplar planting, resettlement of farmers from over-pastured forest areas on to drained land, restrictions on charcoal burning, etc. The use of Pine needles for the curing of tobacco is mentioned as a harmful practice.

1255. Boudy, P. Économie forestière nord-africaine. Tome III. Description forestière du Maroc. **[Forestry in [French] North Africa. Vol. 3. Description of forests and forestry in Morocco.]** Éditions Larose, Paris. 2nd ed. (rev.) 1958. pp. xvi + 375 + 2 maps + 24 plates. [F.] [Price £3 3*s*.]

[Cf. *F.A.* 12 No. 1874.] The previous edition (1951) was based largely on pre-war data and took no account of the considerable afforestation carried out in recent years. The present edition is re-written and enlarged to include such data and also a section on the economic, administrative, and social aspects of the forest. It covers Spanish as well as French Morocco.

1256. **Panel discussion on forest management in Nova Scotia.** *Rep. N.S. Sect. Canad. Inst. For. 1959*, 1959 (39–74). 30 refs.

Includes the following papers: History of forest management in Nova Scotia (*R. M. Bulmer*); Present forest conditions in Nova Scotia (*L. S. Hawboldt*); Forest management in Nova Scotia under the Small Tree Conservation Act (*G. F. Phinney*); Principles of good forest management in Nova Scotia (*A. M. Anderson*); and the report of a committee appointed to consider the effectiveness of the Small Tree Conservation Act, with recommendations for new legislation.

1257. Estimación de recursos forestales del Estado de Michoacán y su importancia económica y social. **[The forest resources of the State of Michoacán [Mexico] and their economic and social importance.]** *Mensajero for., Durango* 17 (170), 1958 (14–5, 23–4, 26). [Span.]

A brief account of the forested area, main species (Pines, Oaks, Firs), increment, utilization in 1955–57, protection, etc. The problems of Michoacán forestry, notably progressive deforestation, are discussed and a 9-point plan proposed to remedy the situation. [Cf. *F.A.* 18 No. 2664.]

1258. Ávila Hernández, M., and López Caballero, A. Aspecto forestal del Estado de Campeche. **[Forestry in Campeche [Mexico].]** *Mensajero for., Durango* 17 (175; 176), 1959 (16–20; 11–3, 16–8). [Span.]

Some of the forest inventory data for the State of Campeche (S.E. Yucatán Peninsula), the total forested area of which is 3,845,000 ha., are presented. Tabulated data include the areas, standing volumes, increment, allowable cut, rotation etc. for the various types of produce (valuable hardwoods, ordinary tropical species, Mangroves etc.). Yield data (in cu.m. and dollars) are given for Mahoganies, ordinary species, and *Achras sapota*, for the years 1947–57. This is followed by a general account of legislation, policy, administration, economics, forest protection, research, education etc. in the State.

1259. Lamb, F. B. **Prospects for forest land management in Panama.** *Trop. Woods* No. 110, 1959 (16–28). 19 refs.

Briefly describes the forests of Panama, present management practices and administration, and possible future policy.

905. Forest Statistics and Resources

See also No. 870.

1260. Korpelainen, L. **Forestry in the Finnish economy.** *Econ. Rev., Helsinki* 1959 (2), (74–82). [E.]

Discusses forest production and its development in 1948–57, and presents tables and graphs showing volume output, income derived from forestry, earnings of forestry workers, etc., for various periods.

1261. Pöntynen, V. **Finland's wood utilization.** *Finn. Pap. Timb.* 10 (5), 1959 (61–4). [E.]

Gives numerical data on amounts used for different purposes (export, industry, farms etc.), loss in floating and logging, natural loss etc., in relation to annual increment for N. and S. Finland and the whole country, and discusses the prospects of increasing industrial supplies without excessive drain of the forest resources.

1262. Ergebnisse der österreichischen Waldstandsaufnahme 1952/1956. Band I. Burgenland. **[Results of the Austrian forest survey 1952–56. Vol. I, Burgenland.]** Forstliche Bundes-Versuchsanstalt Mariabrunn in Schönbrunn, Wien. 1959. pp. [6] + 98 + 173 + 23. [G.] [Cf. *F.A.* 19 No. 5038.]

1263. Polák, O. Podíl lesního hospodářství na budování a dovršení výstavby socialismu v Československu. **[The part of forestry in the building and achievement of socialism in Czechoslovakia.]** *Sborn. Čsl. Akad. Zeměd. (Lesn.)* 5 (6), 1959 (601–16). 9 refs. [Cz.cz.russ.g.]

Compares forest ownership in 1938 and 1958, and discusses the steady drop in increment in 1919–45, the excess of fellings over increment up to 1955, and the gradual elimination of this disparity by planned reductions in felling.

1264. Rukuiža, A. Miškų ūkio būvis dabartinėje Lietuvoje. **[The present situation of forestry in Lithuania.]** *Girios Aidas* 7 (16), 1957 (67–75). [Lith.e.]

A detailed review, with comments, by a former head of the Lithuanian Forest Department, of an article appearing in Vol. 1, 1957, of the revived forestry periodical *Musu Girios* [*Our Forests*]. Some 22·6% of Lithuania is now forested, as compared with 19% in 1939, excluding stands < 5 ha., grazing grounds and roadside trees. Of the total 1,479,500 ha., commercial forests form 69 and protective forests 31%. Forests of national importance, which come directly under the Ministry of Forests, have a forested area of 1,045,300 ha., the kolkhozes 385,400 ha. and the sovkhozes 48,800 ha. For the Ministry forests the areas occupied by each 20-year age class, up to 101-120 years, are tabulated

for 1937, showing a deficit of 10·9% in the 41- to 80-year classes and an excess of 4·3% in the older classes. By 1957 the young age classes had increased by > 500,000 ha., the middle age classes by > 200,000 ha., while the oldest classes had decreased by 70,000 ha., showing that twice the prescribed cut had been removed during the 20 years. By 1957 only 3% of the forested area carried mature trees and 8·2% submature, and regeneration, natural and artificial, was in arrears. Some 30% of the country's forests are now managed by sovkhozes and kolkhozes. By 1957 81% of all fellings, 62% of haulage from stump and 96% of further extraction had been mechanized.

1265. HSIA, E. C. H. **Land use conditions in Taiwan.** *Forestry Series, Chinese-American Joint Commission on Rural Reconstruction, Taipei, Taiwan* No. 5, 1958. pp. 57. 60 refs.

[Cf. *F.A.* 16 No. 1291.] Includes data on the forests, the area of which was found to be much less than estimated in pre-1948 reports. Hardwood and Bamboo types occupy ca. 80% of the 1,969,500 ha. of forest land, and of the accessible land 62% has a timber volume of < 50 cu.m./ha., and nearly 80% a volume of < 100 cu.m./ha. The rapid land-use changes since 1945 from brush and hardwood forest to upland farming (often with deleterious results) are discussed.

1266. LARSON, R. W., and BRYAN, M. B. **Virginia's timber.** *For. Surv. Release Stheast. For. Exp. Sta.* No. 54, 1959. pp. 72 + 1 map.

A second survey, completed in 1957, showing changes since the first survey in 1940, and discussing trends.

1267. HARTONG, A. L., and MOESSNER, K. E. **Wooded strips in Iowa.** *For. Surv. Release Cent. St. For. Exp. Sta.* No. 21, 1956. pp. 15.

Reports results of an aerial survey of forest land less than 1 acre in size or 120 ft. wide in the 3 major forest regions of Iowa.

1268. HERRINGTON, R. B. **Opportunities for expansion of the timber industry.** *Bulletin, School of Forestry, Montana State University, Missoula* No. 9, 1959 (8–10). 2 refs.

A brief economic review of the region (comprising Idaho, Montana, Wyoming, Arizona, Colorado, Nevada, New Mexico and Utah), assessing its potential as a source of timber, particularly with reference to long-term national and local requirements for high-quality softwoods.

907. Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)

See also section 116.

1269. VAUGHAN, R. E. **Nature reserves in Mauritius.** *Repr.* from *Comptes Rendus, 3e Congrès de la P.I.O.S.A., Tananarive (Sect. B)* 1957 (125–31). [E.]

Emphasizes the importance of preserving and further developing such reserves in the light of the ecological and biological damage caused by continued wholesale removal of native hardwood species, especially Ebony, under population pressure.

91. Land Use, Land-Use Policy (including Afforestation Policy)

See also Nos. 873, 1265.

1270. HUNTER, J. R. **A new guide to land use planning in tropical areas.** *Ceiba, Tegucigalpa, Honduras* 8 (2), 1959 (44–70). 49 refs. [E.]

The scheme proposed is based on Holdridge's ecological classification [cf. *F.A.* 10 No. 934]. The formations discussed, from moist páramo in the subalpine zone to savannas, dry forests, moist forests, wet forests and rain forests in the lower montane belt, the subtropical belt and the tropical lowland belt, are all American, but the system is considered of general application.

1271. AHMAD, S.-U.-D. **An international study of the arid-zone land use problems.** *Pakistan J. For.* 8 (4), 1958 (385–410); 9 (1), 1959 (96–117). 143 refs.

Mainly a review of work done and literature published in the U.S.A. and U.S.S.R. as well as Asia.

1272. DENG, C. H. Chinas Anstrengungen zur Aufforstung. **[China's afforestation effort.]** *Holz-Zbl.* 85 (80), 1959 (1055–7). 5 refs. [G.]

Presents mostly data from Chinese official sources, of achievements up to the end of 1958, work in progress, and plans, location, type of forest (protection, fuel, timber production) etc., listing species for various climates and soils. The use of *Haloxylon ammodendron*, largely by aerial sowing, in the 'green wall', 700 km. long, to contain the S. Dzungarian desert is mentioned specially. [Cf. *F.A.* 20 No. 5427.]

92. Forest Ownership and Ownership Policy

See also No. 1263.

1273. MERRIAM, L. C., JR. **Forestry on Oregon State Highway Commission Lands.** *J. For.* 57 (8), 1959 (558–60). 5 refs.

Oregon and Montana are apparently the only states in the U.S.A. where the State Parks and State Highway Organizations are combined under the State Highway Commission. The nature of the Commission's forest lands, the management problems, and the activities of the highway foresters are briefly reviewed.

1274. HURÉ, B. Le curieux régime forestier de la commune de Beuil et les bandites dans les Alpes Maritimes. **[The curious forest regulations of the commune of Beuil and private rights of pasture in the Alpes Maritimes.]** *Rev. for. franç.* 11 (8/9), 1959 (585–91). [F.]

The communal forests are still regulated by the conditions of a charter granted by the feudal lord in 1467. 'Bandites' were communal lands leased to a single tenant, giving him exclusive rights of pasture and abrogating rights of transhumance.

1275. ZIVNUSKA, J. A. **Private forestry in Norway—a case study in small woodland management and policy.** *For. Sci. Monogr., Wash.* No. 1, 1959. pp. 49. 36 refs.

A study carried out during 1954–55 while the author was on a Fulbright grant. Describes in some detail the system of co-operative marketing, state subsidies, and legal regulation of private forestry.

1276. HUGGENBERGER. Die Privatwaldförderung in Bayern. **[Helping the private owner in Bavaria.]** *Allg. Forstzeitschr.* 14 (27), 1959 (480, 482). [G.]

Briefly describes the development and organization of a State Service for owners of woodlands of < 100 ha. (mostly farmers), aiming chiefly at advice and training, with occasional help (against payment) in marking for felling etc. but not in management or supervision. An improvement in general attitudes and practices (e.g. as regards litter or grazing) is noticeable.

1277. SWINGLER, W. S. **Improving small woodlands in the United States.** *Unasylva* 13 (2), 1959 (66–76).

1278. HALL, A. G. **The small woodland conferences. What they have accomplished.** *Sth. Lumberm.* 197 (2465), 1958 (150–2).

Briefly reports on a series of conferences held in 1958 by the U.S. Forest Service and other bodies to discuss means of raising productivity on small woodlands (4·5 million holdings of < 5000 acres, averaging 60 acres). Lower credit charges and taxation, marketing facilities and research into utilization of species and qualities not now in demand were recommended with varying emphasis.

1279. NARIOADIREDJO, R. H. Kemungkinan-kemungkinan membangun hutan rakjat disekitar Notog (Keresidenan Banjumas). **[Possibilities for private forests near Notog (Banjumas residency) [central Java].]** *Rimba Indonesia* 8 (1/2), 1959 (3–61 + 2 maps). 19 refs. [Jav.jav.e.]

Of the 3 pulpwood species, *Agathis loranthifolia*, *Pinus merkusii* and *Albizzia falcata*, only the last is suitable for private planting near the Notog paper plant. Some 2470 ha. of eroded and depleted land within 25 km. could be planted. A controlling committee would be necessary to ensure an even supply of material. *From author's summary.*

1280. WATTERSON, G. G. **Consolidation of afforested land.** [*Docum.*] *3rd Session of the Working Party on Consolidation of Holdings, FAO, Rome 1959* No. *FAO*/59/3/2157, 1959. pp. 5.

Discusses the role of farm woodlots in the farm economy, legal measures adopted in various countries to prevent fragmentation or mitigate its effects, and the need for governments to co-ordinate their national agricultural and forest policies.

93. Public Supervision and Regulation of Forestry, including Legislation for these Purposes

See also Nos. 871, 1256, 1274–5.

1281. MARINELLI, A. Legislación forestal argentina. **[Forest legislation in Argentina.]** *Rev. argent. Agron.* 25 (4), 1958 (159–70). [Span.] E.M.B.

Reviews and discusses the history of forest legislation in Argentina, and the present situation.

1282. TRONCO, G. Pertinenze idrauliche demaniali e pioppicoltura. **[State-owned alluvial land and Poplar cultivation.]** *Cellulosa e Carta* 10 (5), 1959 (7–16). [It.f.e.g.]

Examines the legal, technical, and social implications involved in the granting of concessions for Poplar growing on newly formed alluvial lands owned by the State in the flood-plain of the Po, with particular reference to the hardships caused to small landowners whose property borders on the lands in question.

1283. WATSON, H. M. **Tree preservation orders.** *J. Land Agents' Soc.* 58 (7), 1959 (243–50).

Notes based on the writer's experience as a County Planning Officer, and on the policy of Worcestershire County Council.

94. Other Methods to Implement Forest Policy

See also Nos. 871, 1275–8.

945.1. Advisory and Information Services, Documentation Centres

1284. FRAUENDORFER, S. Entwicklung und Stand der forstwirtschaftlichen Dokumentation. **[Development and present state of forestry documentation.]** *Cbl. ges. Forstw.* 76 (2), 1959 (73–83). 13 refs. [G.]

Traces the history of bibliography and classification, and includes a discussion of the Oxford System of Decimal Classification, the coverage of Forestry Abstracts, and a mention of the Centralized Title Service.

945.3. Education. Training. (Including Educational Tours and Information on Careers)

See also No. 520.

1285. Escuela de capacitación forestal de Guatemala. Catálogo 1958–1959. **[Forestry school of Guatemala. Syllabus 1958–1959.]** Escuela de Capacitación Forestal, Amatitlán. 1958. pp. 29. [Span.]

This graduate school was created in 1957 by agreement between the governments of the U.S.A. and Guatemala, under the auspices of the Inter-american Cooperative Agricultural Service. Information is presented on the school and its facilities and equipment, with details of the syllabus.

1286. REHSCHUH, D., and PIORK, A. Die Ausbildung der Waldbesitzer in Finnland. **[The training of [small] forest owners in Finland.]** *Holz-Zbl.* 85 (80), 1959 (1057–9). [G.]

Chiefly on the organization of training, schools, curricula, etc., by the two large organizations, of forest owners, Tapio [cf. *F.A.* 20 No. 4025] and Skogskultur and on their other advisory or extension work. The authors note in particular the stress laid on advance planning of all operations, e.g. logging, planting, or draining. [Cf. *F.A.* 18 No. 3602.]

1287. **Forestry and the town school.** Forestry Commission, London. 1959. pp. 19.

Outlines a forestry project undertaken from September to July in a local park by 10- to 11-year-old children at a S.E. London primary school. Details are given of the classroom work done and field visits made, emphasis being laid on the importance of visual aids and of the monthly maintenance by each child of personal tree records. In view of the keen interest shown it is considered that,

with certain modifications, the instruction given, especially in elementary mensuration with 'home-made' tree-calipers and hypsometers, would offer a suitable basis for more advanced forestry classes at schools.

1288. WINKELMANN, H. G. **Recommendations to the Government of India for the improvement of logging and extraction in the forests of the four Northern States.** FAO, Rome. No. *FAO*/58/10/7543, 1958. pp. 10. Limited distribution.

A further interim report [cf. *F.A.* 19 No. 2600] following a training course held at Batote.

945.4. Research

See also Nos. 893–4, 1250.

1289. ROTH, G. A magyar erdészeti kutatásügy története 1898–tól 1940–ig. [**Forestry research in Hungary, 1898–1940.**] *Erdész. Kutatás., Budapest* 1958 (3/4), (5–18). 30 refs. [Hu.russ.e.g.]

Reviews the history of forest experiment stations in Hungary, and outlines the main fields of their activities.

1290. KOLOSSVÁRY, S. A magyar erdészeti kutatásügy fejlödése 1945–töl 1958–ig. [**Forestry research in Hungary, 1945–58.**] *Erdész. Kutatás., Budapest* 1958 (3/4), (19–65). 275 refs. [Hu.russ.e.g.]

A review of work in afforestation of sandy, alkaline and barren soils, breeding, silviculture, site studies, forest utilization, tree seeds, mechanization, game management etc. Almost all the references are to Hungarian literature.

1291. Rapports d'activités des commissions nationales du peuplier. République Arabe Unie: Région Syrienne. [**Reports of the activities of the National Poplar Commissions: Syria.**] [*Docum.*] *10th Sess. Int. Poplar Comm., 1959* No. *FAO* 59/7/5626, 1959. pp. 8. [F.]

Populus euphratica was successfully propagated from cuttings without special treatment. Some information on pests and on the areas under various Poplars is given.

1292. **A classified directory of workers in the economics of forestry in the United States and Canada.** *J. For.* 57 (9), 1959 (651–9).

Lists the workers alphabetically (giving private address, post, organization, qualifications, age, membership of learned societies, etc.), and by fields of specialization or interest.

1293. GAINES, E. M., and SHAW, E. W. **Half a century of research—Fort Valley Experimental Forest [near Flagstaff, Arizona] 1908–1958.** *J. For.* 57 (9), 1959 (629–33). 22 refs.

Reviews personnel and research, with a selected list of 22 of the more important publications.

1294. **Guide to Susanville Research Center.** Pacific Southwest Forest and Range Experiment Station, Berkeley. 1959. pp. 12.

Describes briefly the centre, a unit of the Pacific Southwest Forest and Range Experiment Station, its research facilities and programme, and current projects.

946.1. Associations. Societies

1295. Jahresbericht 1958. [**Annual report 1958.**] Deutscher Forstverein, Bonn-Duisdorf. 1959. pp. 420. 44 refs. [G.]

Includes the following papers, with discussions [also published as *Landwirtschaft—Angewandte Wissenschaft, Hiltrup bei Munster*, No. 91, under the title 'Structural changes in German Forestry']: Structural changes in the demand for wood, and their impact on forestry (*Ernst*); European economic policy and German forestry ([*K.*] *Mantel*); The general trend of costs and demand—a decisive factor in the growing of Beech (*Borchers*) [discussing chiefly the problems of Lower Saxony]; The potentialities of Pine in the inland diluvial area of Lower Saxony (*H. Junack*); Modern pulping techniques in Germany, and what they mean for German forestry (*R. O. H. Runkel*) [chiefly discussing semi-chemical, high-yield, and chemigroundwood pulping methods, raw materials, yields, and uses]; The cost structure of forest enterprises and its development (*E. G. Strehlke*) [discussing the need for raising productivity etc. in view of rising cost levels and probably permanent falls in prices]; and Forest and game (*Rossmässler; E. Ueckermann*). Also reports of 29 excursions covering many parts of Germany.

946.2. Conferences and Excursions

1296. Congrès régional du châtaignier, Hérault, Gard et Ardèche, 28–30 September 1956. [**Regional Chestnut Conference, Hérault, Gard and Ardèche, 28–30 Sept. 1956.**] *Bull. tech. Châtaignier Éc. Eaux For. Nancy* No. 5, 1958. pp. 143 + 4 plates. [F.]

Includes, in addition to regional reports and notes on study tours, the following papers: The biology of insect pests of Chestnut (*Balaninus elephas, Laspeyresia splendana*, and *Pammene juliana*) (*R. Coutin*); The use of insecticides to control Chestnut pests (*J. Coulon*); The agents of decay in Chestnut (*M. Darpoux*); The disinfestation of chestnuts by physical methods (*Schenk* and *Vago*); Results obtained [by breeding] in the control of Chestnut diseases (*M. Schad*).

1297. **First New Zealand Agricultural Science Conference.** *Proceedings of the New Zealand Institute of Agricultural Science, Wellington 1958,* 1959 (21–114).

Includes a paper on forest products (*A. P. Thompson* and *M. B. Grainger*) with discussion, dealing mainly with possible future trends in use of forest products.

95. Forest Taxation

See also No. 871.

1298. SAETHER, R. Skogbeskatningen og noen av dens økonomiske virkninger. [**Forest taxation and some of its economic effects [in Norway].**] *Meld. Inst. Skogøkon. Norges LandbrHøgsk.* No. 11, 1958. pp. 53 + 12 sets of gphs., 3 tbls. 20 refs. [Nor.]

Discusses the general principles and purposes of direct taxation and its bases (income and property taxes). Outlines the development of forest taxation

in Norway since 1882, and the regulations for calculating both income and property tax on forests, valid until 1 Jan. 1959, with examples, based on data for 6 forest owners, incomes ranging from Kr.20,000 to Kr.200,000 and property from Kr.200,000 to Kr.2,000,000, showing the effect of the same variables on taxes paid by each.

1299. Saether, R. Beregningen av de direkte skatter etter gjeldende skattesatser fra 1. januar 1959. **[Calculation of the direct taxes [in forestry] according to the [Norwegian] regulations valid from 1 Jan. 1959.]** *Meld. Inst. Skogøkon. Norges LandbrHøgsk.* No. 12, 1959. pp. 14 + 19 gphs., 1 tbl. [Nor.]

Supplements the information given in *Meld. Inst. Skogøkon. Norges LandbrHøgsk.* No. 11 [see preceding abstract] giving the calculations as affected by the new regulations.

1300. Sellæg, H. Om de nye skattereglenes innvirkning på omsetningsverdien for skog. **[The effect of the new tax regulations on the selling value of forests.]** *Norsk Skogbr.* 5 (15), 1959 (387–8). [Nor.]

Discusses the changes caused by the regulations introduced in 1954, with two examples.

96. Forest Labour Questions. Labour Questions in Wood Transport and the Wood Industries

1301. Krauss. Die Waldarbeitsverhältnisse im unterfränkischen Staatswald. **[Forest labour in the State forests of Lower Franconia.]** *Allg. Forstzeitschr.* 14 (37), 1959 (657–60). [G.g.]

Analyses and discusses data from the 1958 official statistics. Mean number of working days/ha. was 5·2, 45% of working hours being spent on logging and extraction, 35 on plantations, 14 on roads and the rest on miscellaneous jobs; 40% of the hours worked, and 51% of the wages earned, were on piece work.

1302. Friemer. Bau von Eigenheimen für Waldarbeiter. **[Housing schemes for forest workers.]** *Allg. Forstzeitschr.* 14 (36), 1959 (619–22). [G.g.]

Discusses design of houses, size of holdings (advising against attaching > ca. ½ ha.), costs and the various financing and credit schemes available in W. Germany.

97. International Forest Policy and Other International Collaboration

971. Congresses, Conferences

See also No. 519.

1303. Mantel, K. Die erste Europäische Forstkonferenz in Brüssel vom 9. bis 11.6.1959. **[The first European Forestry Conference, Brussels 9–11.6.1959.]** *Forst- u. Holzw.* 14 (13), 1959 (269–76). [G.]

An account of the conference (of the European Common Market member countries), with topics discussed, resolutions, etc.

1304. **Proceedings of the 4th World Forestry Congress, Dehra Dun 1954: Vol. II, General and Special Papers on: 1. The present status of forest protection and forest management in the world; 2. Protective functions of the forest; 3. Productive functions of the forest; 4. Forest products utilization.** Manager of Publications, Government of India, Delhi. 1957 [1959]. pp. vi + 812.

Containing 103 papers, some of which are referenced separately in this issue of *F.A.* Others have been cited from earlier publications in forestry journals etc. [Cf. *F.A.* 20 Nos. 1337–8.]

1305. Informe sumario. Comisión Forestal Latinoamericana. VI Reunión (Antigua, Guatemala, 4–15 de noviembre de 1958). **[Summary report, Latin-American Forestry Commission. 6th Session, Antigua, Guatemala, 4th–15th November 1958.]** FAO, Rome. [1958]. pp. 41. [Span.E.F.] Limited distribution.

1306. **Papers, International Union of Forest Research Organizations, 12th Congress, Oxford 1956. Vols. II and III.** Forestry Commission, London. 1958. pp. 312 + 276. [E.F.G.]

(II) Papers read in Sections 23 (Silviculture) and 24 (Forest protection); (III) Papers read in Section 25 (Growth and yield. Forest management); for the most part noticed separately in *F.A.* 18. [Cf. *F.A.* 20 No. 5451.]

FORESTRY THE WORLD OVER

References: 1. *Bollettino Ufficiale del Corpo Forestale dello Stato*, Rome; 2. *British Columbia Lumberman*, Vancouver; 3. *Daily Telegraph*, London; 4. *Economic Botany*, New York; 5. *FAO Press Release*, Rome; 6. *Fire Protection Review*, London; 7. *Forestry Newsletter for the Near East*, Cairo; 8. *Holz-Kurier*, Vienna; 9. *Holz-Zentralblatt*, Stuttgart; 10. *Legno*, Milan; 11. *Newsletter of N.Z. Forest Service*, Wellington; 12. *Pulp and Paper Magazine of Canada*, Gardenvale, Quebec; 13. *Report of the Department of Forestry of North Borneo*, Sandakan; 14. *Soviet News*, London; 15. *Timber and Plywood*, London; 16. *Timber of Canada*, Ottawa; 17. *Times*, London; 18. *Wood*, London.

International

FAO. A commission of FAO has approved the establishment of Regional Forestry Commissions for Africa and for North America. The Director General is urged to convene a first session of the African Forestry Commission before the next session of FAO's Conference in 1961. Arrangements would be made in consultation with member governments concerned and with the Commission for Technical Co-operation in Africa South of the Sahara (CCTA). The headquarters of the region are provisionally at Accra. For the North American Commission, a first session would be held at a time and place to be determined by the Governments of Canada, Mexico, and the U.S.A. (**5**; 17.11.59).

Australia. A company producing wood flour in New South Wales has found that *Pinus radiata* yields a flour comparable in appearance and quality with that from Norway Spruce. It is being made in 3 grades, of 80, 100, and 200 mesh (**11**; Sept. 1959).

Belgian Congo. On the road north from Stanleyville to Buta through the rain forest of the Congo basin, the telegraph wires are attached not to poles but to living trees of *Ricinodendron heudelotii*, a fast-growing species native to the secondary forest of the Belgian Congo. They are planted by cutting poles, 6–10 m. long, from the forest and placing them in suitably spaced holes. During the rainy season the poles quickly strike roots and begin to put out branches and foliage. The telegraph wires are fixed to the pole some 6 m. above the ground as soon as they are firm. The branches, which sprout at the summit of the poles, rarely interfere with the wires. The tree is useful as a living pole only in relatively wet tropical areas, for it requires a warm, humid climate (**4**; April–June 1959).

Canada. Developing the idea of plastic-lined swimming pools common in suburban areas, the Ontario Department of Lands and Forests has been making water storage ponds for fire-fighting purposes in valuable stands. Black polythene is used to line a bulldozed pit and, if the pond is sited in the shade, evaporation is negligible (**12**; Oct. 1959).

Canada's answer to the Russian sputnik is a prototype satellite called the 'Chipnik'. It is a sphere, 8 ft. in diameter, weighing 200 lb., and made of $\frac{1}{4}$-in.-thick red fibreglass. It has an 18-in.-diameter hatchway, and is being tested for transporting pulpwood chips down the Fraser River, B.C. It holds ca. 250 cu. ft. of chips. The sphere is merely launched and left to float downstream unaided until it reaches its destination (**2**; Nov. 1959).

France. On 29th Oct. 1959, officers in the French forest service went on strike to draw attention to the unsatisfactory conditions in the service, particularly in respect of staffing, pointing out that the cadre of trained officers has fallen from 706 ca. 75 years ago to 435, while the forest area has been increasing, resulting in one officer now being responsible for 9400 ha. of forest as against 4250 ha. previously or 2000 ha. in neighbouring W. Germany or Switzerland (**9**; 26.11.59).

Germany. Current research on nematodes in forest nurseries includes trials with so-called anti-nematode plants, e.g. *Tagetes* spp. With *Tagetes erecta* the number of *Pratylenchi* is greatly reduced, but not that of *Rotylenchi* and *Tylenchorhynchi* (**9**; 17.9.59).

Great Britain. By Sept. 1959, the Forestry Commission had, during the season, dealt with well over 4000 fires in or near its woodlands, mainly in young plantations. Many fires were directly ascribed to the carelessness of campers and picnickers, and a total area of 233 acres of the Commission's woodland, representing a loss of many thousands of pounds, was destroyed (**6**; Nov. 1959).

The new 225-ft. Douglas Fir flagstaff for Kew Gardens [see *F.A.* 20 p. 326] posed several problems for the company charged with converting it from the log on behalf of the Ministry of Works. After being hauled up the river bank, across a drainage ditch and into its site in the Gardens by means of

winches and cables and concrete-filled steel pipes acting as rollers, the log was jacked up on timber baulks, barked, covered with a corrugated-iron roof, and left to season for 12 months. The specification stipulated that the first 16 ft. should be of square cross-section, the next 140 ft. octagonal, and the rest circular, with a regular taper throughout its length. To calculate its theoretical centre line, a civil engineering department was called in to survey the log so that chalk lines could be drawn, indicating where the cuts were to be made. Since there was no known log carriage capable of taking a 275-ft. log, hand tools were used—a 48-in. motor-driven chain saw, and a Danarm electric chain saw. Some 19 tons of wood were removed in the cutting operation, in which an accuracy of $\pm \frac{1}{16}$ in. was achieved. The total time taken, discounting that taken for turning the log and other unforeseen difficulties, was 8 weeks. The completed flagstaff was then end-slotted (by chain-saw and chisel) for mounting, and finished with 3 coats of clear Solignum (**15**; 15.10.59).

The T.D.A. was approached by thread manufacturers who wished to discourage the pilfering of Canadian Yellow Birch bobbins, which cost ca. 2*s*. 6*d*. each and were being used as firewood by employees. The management was reluctant to institute searches and preferred to investigate the possibility of developing fire-retardant or fire-proofing qualities in the bobbins. Treatment of bobbin blanks by the T.D.A. with hot 20% solutions of $NH_4H_2PO_4$ appeared to be the answer, and commercial treatment of the bobbins is now proceeding (**18**; Nov. 1959).

Iran. The first set of 28 forest rangers have completed their training at the Forest Rangers' School, Gorgan, and are now being employed by the Forest Service. At the same time, a new forest law has been passed by the Imperial Parliament, requiring that all forests be brought under regular working plans within the next 3 years. Negotiations are in progress for the employment of most of the newly appointed rangers, who had special training in forest management, in this field (**7**; 15.11.59).

Italy. On 21 November occurred the 60th anniversary of the first celebration in Italy of the Festa degli Alberi (Festival of the Trees), at Rome in 1899. The Festa is now celebrated by 8486 local authorities, which together plant more than 1½ million trees. It is now proposed that the trees so planted shall form 'School Forests', to be tended by the children of the local schools (**1**; Oct. 1959).

North Borneo. Tengar bark (the bark of a species of Mangrove) is much in demand in the Philippines for the flavouring of an alcoholic beverage, and continues to be stolen from Borneo. The long coastline of the east coast gives facilities for illegal entry, and a day or two is sufficient to cut a boat-load of bark. During the year 1958, 15 cases were taken to court, and 39 boats confiscated after conviction of the 134 men who manned them. The price paid in the Philippines is apparently worth the risk of a short term of imprisonment and the confiscation of the boat, and stealing will undoubtedly continue in a small way in spite of intensive patrolling by the Marine Police and the Forest Department (**13**; 1958).

Switzerland. A Bernese firm has developed mobile sound-proofing partitions made of 2 chipboards of different thickness, separated by a layer of sound-insulating material and including, in some cases, a sheet of lead. The thicker models (12 cm.) are said to absorb ca. 50 decibels, i.e. about the same as a 25-cm. brick wall (**8**; 29.10.59).

U.S.A. Soaring 195 ft. into the Oregon sky, the world's largest Sitka Spruce tree has been permanently protected from cutting. It was recently made a part of Crown-Zellerbach's picnic area on the company's Clatsop Tree Farm. This tree is 15 ft. 9 in. in diam. at breast height, and measures 60 ft. to the lowest limb (**11**; Sept. 1959).

The Maxim Motor Co., Middleboro, Mass., has produced a heavy-duty lorry with six-wheel drive for forest fire-fighting. A steel bumper completely encircles the vehicle, enabling it to make its own fire path through trees and brush, along which additional fire apparatus and personnel may follow. Its powerful engine, large booster tank, 2 booster reels and rear auxiliary booster pump allow pumping on the move, and enable a man to stand on each side of the lorry, in the cockpit right behind the cab, and to fight fires as the vehicle moves (**6**; Oct. 1959).

The Mereen-Johnson Machine Co., Minneapolis, Minnesota, has designed a heavy-duty ripsaw incorporating 4 live rolls, and an improved, independently actuated feed mechanism. It is claimed that the saw can rip material from ¼ to 2½ in. thick, including bundled veneers, without re-setting the rolls, that the feed mechanism makes possible efficient handling of material as little as 13 in. in length, and that the vertically adjusted arbor great facilitates saw changes (**16**; Nov. 1959).

A do-it-yourself Christmas tree has been invented. Produced and packed by a firm in Oregon, it

consists of a 6-ft. trunk, in which 9 rows of holes have been bored at regular intervals, and 46 fireproofed Douglas Fir boughs. All the buyer has to do is to insert the boughs in the appropriate holes (**3**; 12.12.59).

A recent American motor car catalogue referred to the interior decoration of its latest *de luxe* models as being made of 'real tree wood' (**17**; 13.11.59).

Eight fire fighters of the United States Forest Service are being tried at Riverside, Calif., on charges of maliciously starting fires. The reason, the Forest Service says, was boredom (**3**; 18.11.59).

U.S.S.R. Large-scale planting of 'Iron Birch' [*Betula schmidtii*, cf. *F.A.* 20 No. 1519] has begun in the Far Eastern Maritime Province of the U.S.S.R. This species, remarkable for the extreme density of its wood, grows exclusively in the taiga zone of the Maritime Province. Experiments have shown that it can be used as a substitute for metals (**10**; July 1959).

Drought-resistant Poplars have been bred in a programme involving artificial pollination and vegetative hybridization of a Poplar of the section *Turanga* growing in the Amu Darya valley. A fast-growing variety named Mir (Peace) is one of the results of the work (**14**; 1959).

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